Navigation Improvement Report
and Environmental Assessment

John F. Kennedy Library Pier
Columbia Point
Dorchester, Massachusetts

US Army Corps
of Engineers
New England Division

MAY 1987

NAVIGATION IMPROVEMENT REPORT
AND ENVIRONMENTAL ASSESSMENT

JOHN F. KENNEDY LIBRARY PIER
COLUMBIA POINT
DORCHESTER, MASSACHUSETTS

PREPARED BY
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FOR:
NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

EXECUTIVE SUMMARY

This report addresses a proposal by the National Archives and Records Administration (NARA) to construct a pier in Dorchester Bay at the John F. Kennedy Presidential Library, Columbia Point, Dorchester, Massachusetts. The pier would provide for increased public access to the Library by allowing ferry and tour boat connections to other historic, educational and tourist attractions on the Boston Waterfront, many of which are more convenient to public transportation systems. The pier would also provide limited access and docking for transient pleasure craft visiting the library and serve as a berthing and supply point for a research vessel to be acquired by the University of Massachusetts (U. Mass) to augment their Marine Sciences programs.

This report constiututes Phase I of a 2-part effort. It documents issues of siting and scoping of the project which are included in the Environmental Assessment. Potential project impacts together with initial project design and cost estimates are provided.

Initial coordination with appropriate state and federal agencies and local officials as required under their permitting and review authorities has been carried out and is documented in this report. Issues and concerns raised by these various agencies are also addressed in the Environmental Assessment.

This report serves as a basis for decision making by NARA to move forward into final project design as a second effort. Once a decision is made to proceed to construction, NARA will arrange for final design, plans and specifications and final regulatory and permitting requirements.

Two sites were examined for pier construction. The first is located at the Library pavilion itself on the northeast corner of Columbia Point and is referred to as the Library Site. The second is located about 1,200 feet further south along Columbia Point immediately south of the abandoned Sewage Pumphouse. This is referred to as the Pumphouse Site.

Pier construction costs were determined to be similar for both sites. Dredging quantities for provision of an access channel and maneuvering basin at the pier were determined to be somewhat higher for the Pumphouse site; 89,500 cubic yards, than for the Library Site; 69,000 cy. All dredging would be to a depth of -10 feet at mean low water (mlw) in order to accommodate the largest classes of ferry craft projected to use the new pier. Chemical contamination of the sediments to be dredged was significantly higher at the Pumphouse site, and was determined to likely preclude ocean disposal of sediments from that site. In addition, the Massachusetts Historical Commission noted that the granite block sewage pumphouse is considered a historic structure and raised concern over the adverse aesthetic impacts that any adjacent pier would have on the pumphouse.

The Library site exhibited far less potential for adverse impacts and was, therefore, chosen for more detailed study. Such high-cost investigations as Bioassay/Bioaccumulation, Priority Pollutant scans and the subsurface boring and probing program were conducted only for the Library Site.

While the library site provides greater ease of access for the public visiting the Presidential Library, the site is further from U. Mass than the Pumphouse site. This less convenient location for U. Mass should be weighed against the convenience of Library visitors and the adverse environmental impacts and higher cost associated with dredging at the Pumphouse Site.

For the purposes of the Library, the pier need only support pedestrian traffic and bear the loading of a berthed ferry vessel at it's end which would also be supported in part by several timber dolphins.

The University's current requirements are for a much more versatile structure capable of bearing a truck carrying a two and one-half ton load. The University also desires installation of a crane to transfer this load between truck and vessel. Also included in the University's requirements are heavy duty electrical service for the berthed research vessel and its equipment, telephone connections between the vessel's berth and school, fresh water supply and sewage connections to the berthed vessel. The Library's only utility requirements are for light duty electrical service for lighting the pier's pedestrian and waiting areas at night. A joint use pier would, therefore, be more costly than a pier built exclusively for ferry terminal use.

Two alternative pier designs were investigated, one a timber pile and deck design, the other a precast concrete deck on square concrete piles. The pier would extend about 110 feet seaward from the capstone of the existing riprap slope at the Library pavilion. The pier deck would be about 20 to 25 feet wide with a 20 to 25 foot-square "L" to the south at its end. A line of four mooring dolphins, composed of 14 wood piles each, would be placed perpendicular to the pier at 50-foot intervals beginning 50 feet to the south of the south side of the end of the pier "L". A fifth such dolphin would be located 50 feet north of the pier's north side. The pier and dolphin arrangement would provide over 300 feet of berthing space for the ferry and research vessels. Detailed descriptions and plans for the proposed pier can be found in Section B of the report.

A timber catwalk would extend along the back of the line of dolphins extending south of the pier to allow access to the University's berthed vessel. The vessel would be moved to the pier itself for heavy loading and sewage pump-out.

A floating platform, 10 feet by 20 feet, would be located along the north side of the pier and connected to the pier with a gangway. This float would serve as a transfer point for passengers of visiting recreational craft. The float and gangway can be removed during the winter to prevent ice and storm damage.

The total cost of dredging and ocean disposal of material dredged from the Library site is estimated at $800,000. All materials proposed for dredging would be removed by bucket dredge, placed in scows and towed 25 miles east to the Foul Area in Massachusetts Bay for ocean disposal. Chemical, physical, and biological sampling and testing of the sediments from the Library Site show that the material is acceptable for ocean disposal at the Foul Area. Total costs for dredging and ocean disposal at the pump house site, even if the material was shown to be suitable for dredging and ocean disposal would be $1,011,000. These costs include estimates for the acquisition and placement of six navigation aids, all steel can buoys, as recommended by the U.S. Coast Guard at either site.

The cost of constructing a pier at either site, would be about $490,000 for the timber design and $440,000 for the concrete design. The total cost of pier construction and dredging at the Library Site would be about $1,240,000 and $1,290,000 for the concrete and timber designs respectively.

Dredging and disposal activities would be conducted prior to pier construction. Dredging would be accomplished in the mid-fall to early-spring time frame to avoid the shellfish spawning season and periods of heavy recreational boating traffic. Dredging operations would take approximately 3 months, while pier construction and dolphin placement would take an additional 4 months.

This report is comprised of three Sections: A, B, and C. Section A comprises the Environmental Assessment for the project including the Bioassay-Bioaccumulation Report. Section B comprises the pier design and cost estimates, channel and basin design and cost estimates, a summary of structural calculations for the pier and the geotechnical report. Section C contains copies of all pertinent correspondence between NARA, NED and other Federal, State and local agencies and interests.

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FIGURE 1
PROJECT LOCATION

NAVIGATION IMPROVEMENT REPORT

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SECTION A

ENVIRONMENTAL ASSESSMENT

PREPARED BY:
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This Environmental Assessment

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I. Environmental Assessment

A. Introduction

The proposed project involves the dredging of a channel and construction of a commercial pier in proximity to the John F. Kennedy Library, Boston, Massachusetts (see Figure A-1). The channel would provide deep draft vessel access to the pier from the Dorchester Bay Federal channel, for a commercial ferry service to the area. The purpose of this construction is to accommodate a water bus service to the library for tourism and provide dockage for the University of Massachusetts research vessels. The dredged material will be transported to the Foul Area Disposal Site by barge and disposed.

B. Purpose and Need

1) Purpose

This project is proposed by the National Archives and Records Administration (J.F.K. Library) in conjunction with plans for a water bus which would link all of Boston's major attractions including the Paul Revere House and Old North Church; the Constitution and its adjacent museum; the New England Aquarium and Quincy Market; the Childrens' Museum; the Computer Museum; and the Tea Party Ship. The channel and pier construction would also provide dockage for the research vessels of the University of Massachusetts.

Water bus access to this area for tourists would provide a unique complement to the recreational use of Boston Harbor and increase visitors to the Kennedy Library. The University of Massachusetts will also have its public access improved, for students and employees. The research and transient recreational vessels mooring in the area would contribute to the utility of the project.

2) Authority

The National Archives and Records Administration has the controlling authority and responsibility for maintenance of presidental libraries. The John F. Kennedy Library/National Archives has requested the Corps of Engineers to prepare an engineering feasibility study including this Environmental Assessment.

C. Proposed Project Description

1) Dredging

The configuration for the proposed Kennedy Library Dock access channel is depicted in Figure A-1. The limits of the subtidal area proposed for dredging, including the area altered by the formation of side slopes and a one-foot overdredge allowance, are shown in Figure A-2.

The three (3) meter (minus ten (-10) foot mean low water) deep channel would be dredged from the proposed pier and mooring to the Dorchester Bay Federal channel. The channel is proposed to be 36 meters (120 feet) wide at the intersection of the Dorchester Bay channel, proceeding westerly approximately 640 meters (2100 feet) to the proposed pier. The anchorage and mooring areas would be approximately 4.7 acres. The alternative project site considered is also depicted in Figure A-1 and discussed in Section D below.

2) Pier Construction

The proposed pier will be 33 meters (110') long perpendicular (east) from the Columbia Point Balustrade (See Figure A3). At the end of the pier a 15 meter (50') deck extension will run south and parallel to the balustrade which will access a 35 meter (117.5') long catwalk. The deck proposed would be 6 meters (20 feet) wide of precast concrete. The pier will require approximately 30 pilings driven 7.5 to 15 meters (25 to 50 feet) into the substrate. Additionally, five turning dolphins will require 14 piles of similar depth (see Figure A-3).

Two alternatives have been developed for location of a small craft access float and gangway. One location, to the north of the pier's outer end would provide greater ease of access for small craft. The other location would be behind the pier's "L" with a gangway leading shoreward to a small pile supported platform added to the south side of the pier over the toe of the rip-rap bank. The second location would provide a reduced ease of access for small craft but may experience a minor increase in wave protection due to the pier's pilings. The second location would also allow the pier's north face to be used as an additional large craft berth.

3) Disposal

The dredged material is proposed to be disposed at the Foul Area Disposal Site (see Figure A-4). A clamshell bucket dredge will load the excavated material on to a barge to be transported to the Foul Area Disposal Site. This disposal would total approximately 70,000 cubic yards of material and require approximately 50-100 round trips for the barge.

D. Alternatives

1) Dredging

The dredging of a channel and anchorage area is proposed at two potential sites. One site is immediately adjacent to the John F. Kennedy Library building (see Figure A-1) and will henceforth be termed the "Library Site". The other proposed docking area is south of the pump house as indicated in Figure A-1 and will be termed "Pump House Site" for this assessment. The safe navigational dimensions of the channel are approximately 640 meters (2100 feet) in length, 36 meters (120 feet) wide and three (3) meters (10 feet) in depth.

This assessment analyzes the two proposed sites (Library Site and Pump House Site), not alterations in the channel configurations. The dimensions of the channel are designed for safe navigation, hence alterations will not be practical.

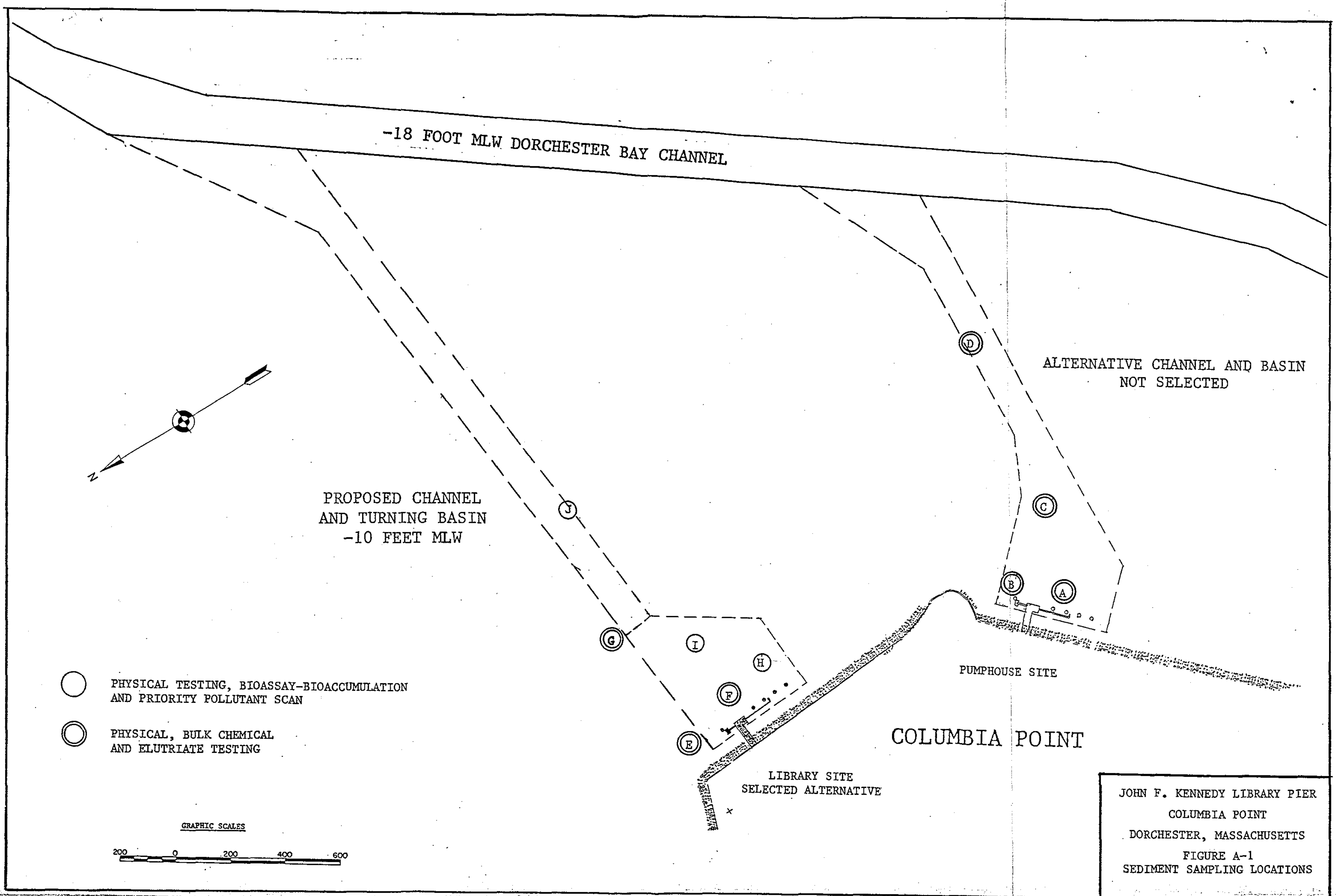

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FIGURE A-1
SEDIMENT SAMPLING LOCATIONS

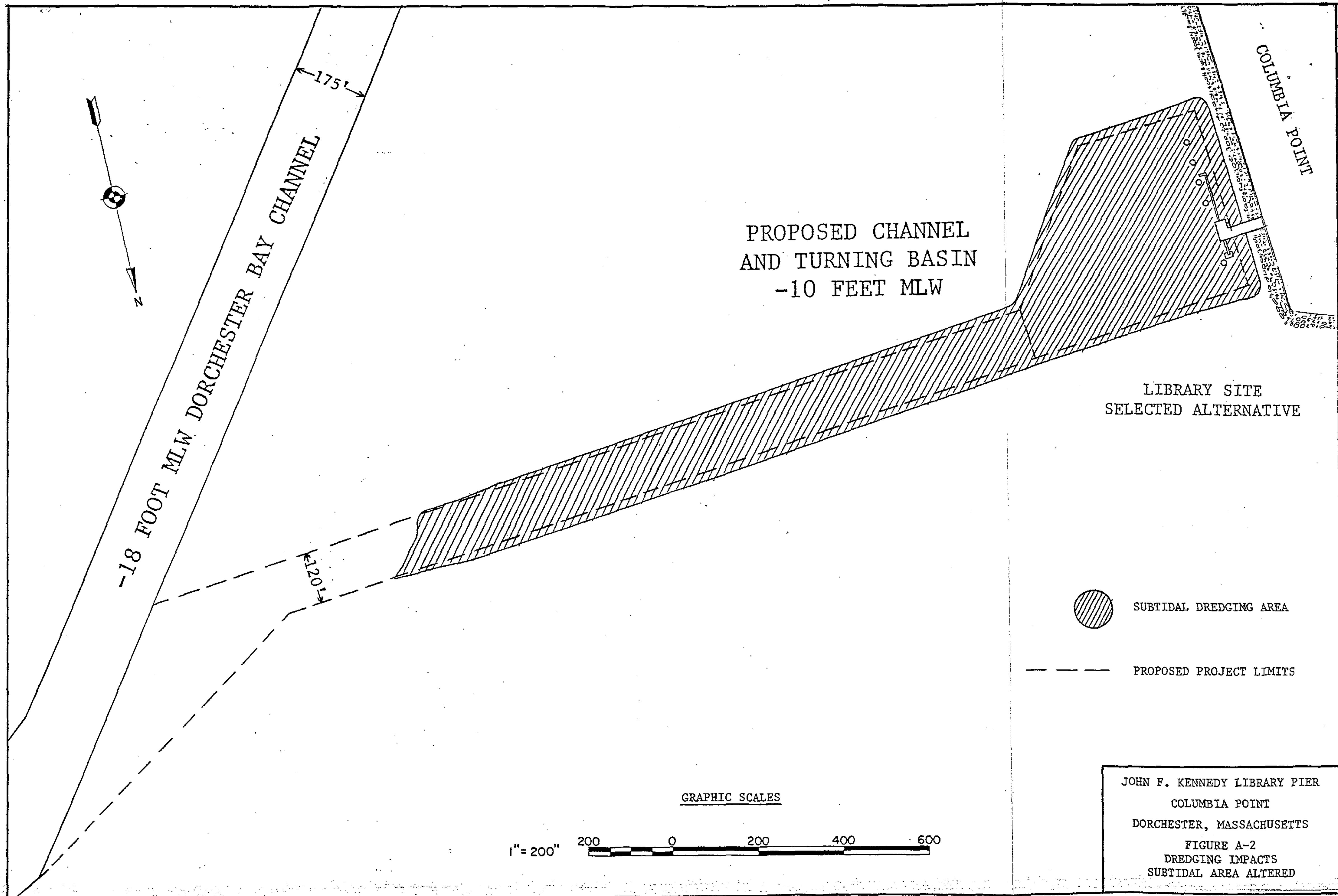

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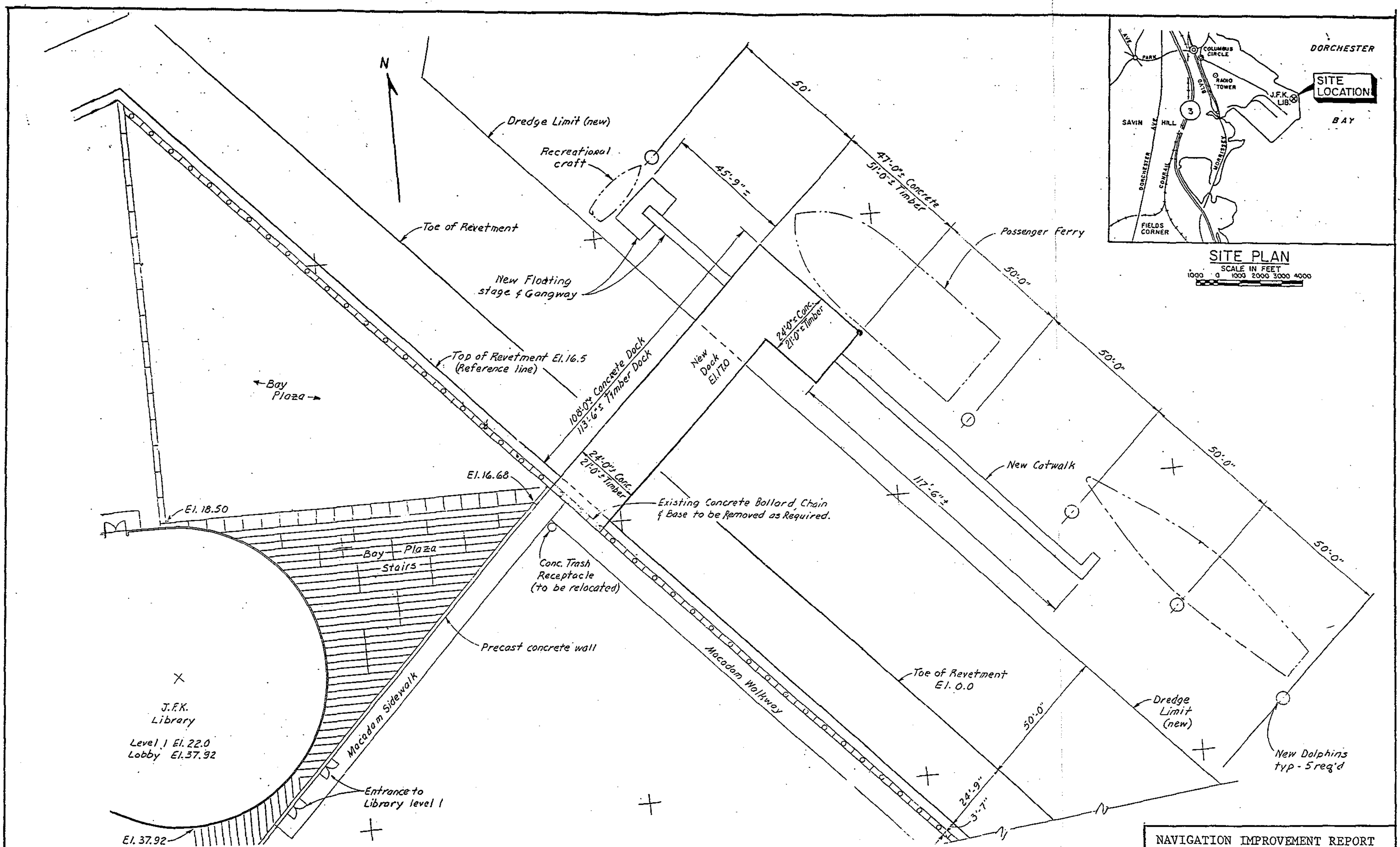
FIGURE A-2
DREDGING IMPACTS
SUBTIDAL AREA ALTERED



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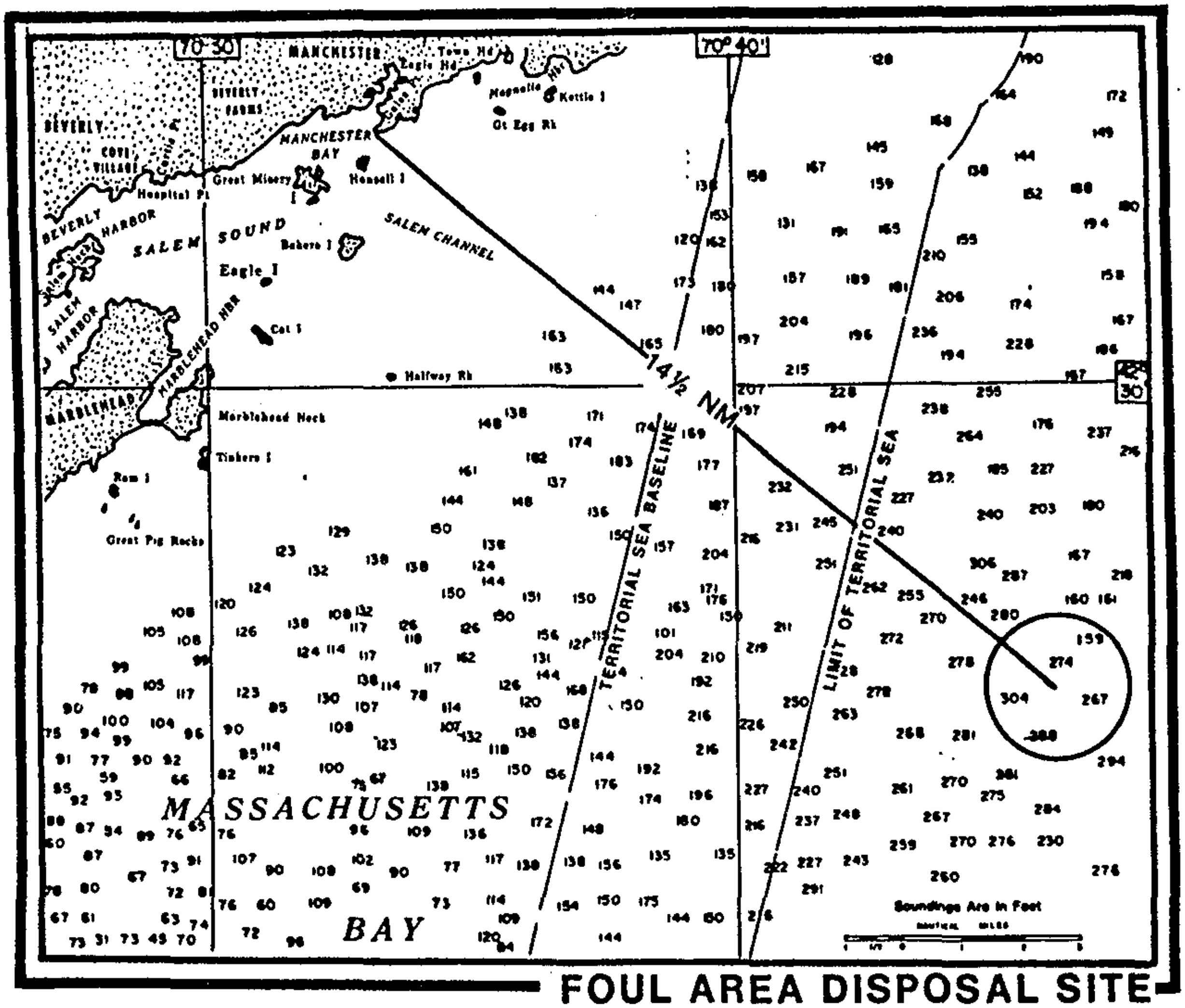
ENVIRONMENTAL ASSESSMENT

FIGURE A-3

PRPOPOSED PIER LOCATION



FOUL AREA DISPOSAL SITE

Description: This site is a circular area with a diameter of 2 nautical miles and center at 42°-25.7'N, 70°-34.0'W. From the center, the Marblehead Tower bears true 282° at 24,300 yards and Baker Island Horn bears true 300° at 24,300 yards. The authorized disposal point (within the overall disposal area) is specified for each dredging project in other project documents. Depth Range: 159 to 304 feet MLW

NOTE: The map depicts the disposal site's location in relation to landmarks. It is not intended for use in navigation.

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FIGURE A-4

RECOMMENDED OCEAN DISPOSAL SITE

2) Disposal

The only practical alternative for disposal is at the Foul Area Disposal Site. Susaki and Associates (1983) have conducted an extensive survey of the Boston Harbor area for disposal site alternatives (upland, containments, etc.). This report indicates two upland sites available in the vicinity of the proposed Kennedy Library Dock dredging project. These sites are 0.7 acres (13,500 cubic yard capacity) along the south side of the Charles River and three acres (85,000 cubic yard capacity) west of Dorchester Avenue (Sasaki & Associates, 1983). After review of environmental and economic feasibility, using nine siting criteria developed for the office of Coastal Zone Management, neither of these sites are considered viable. One site is currently in the area of the proposed Third Harbor Tunnel project for airport access and although it is capable of retaining 85,000 cubic yards, it is not currently available for other project uses. The only other upland site identified in the Sasaki (1983) report is capable of retaining 13,500 cubic yards. This small site is also identified as non-viable by the report for environmental concerns, economic constraints, and poor accessability (through Charles River locks).

The only practical alternative is barge disposal of material at the Foul Area Disposal Site. This ocean disposal site is being extensively monitored and managed by the Corps of Engineers to meet the need of the greater Boston region.

3) Pier Construction

The two alternative types of piers currently available are solid fill piers, usually a concrete mat on top of rock fill, or a piling pier, essentially a deck on pilings.

A solid fill pier, not on pilings, destroys subtidal substrate, alters circulation patterns and disallows recolonization of the substrate after construction. The piling type structure allows epifauna to establish on the structure and leaves the substrate under the pier relatively undisturbed. The most practical alternative is the proposed piling pier. This design accounts for sound engineering and least environmental impacts.

E. Affected Environment

1) Dredging Site

a. Physical Characteristics

On 23-24 November 1985 the substrate at seven stations were sampled by the New England Division (NED), Corps of Engineers for chemical and physical analyses. Stations A through D (see Figure A-1) were in the proposed Pump House Site channel. Stations E through G are in the area of the Library Site channel. Physical analyses including grain size curves (Wentworth classification) are included in Appendix I.

At the Pump House Site, Station A was cored to a depth of 36 cm. The upper 10 cm of this core was composed of dark grey clayey sand (SC) with a trace of shell fragments. This sample contained 18.0% fines ($\geq$ 4 phi). The 10 to 36 cm strata was olive grey clayey sand (SC) with a slightly higher silt/clay fraction of 40.0% fines. Station B was also olive grey clayey sand (SC) with 26.0% fines to a sample depth of 36 cm. Station C is predominantly fines (52.0%) to a depth of 34 cm, being composed of olive grey sandy organic clay (OL). Station D was 90.5% fines to a depth of 84 cm being a dark grey organic clay substrate. In general the substrate increase in grain size from clay to sand from Stations A through D at the Pump House Site, reflecting current scouring in the more exposed sites farther from the shoreland.

The Library Site was sampled at three stations (E, F, and G - Figure A-1). The substrate at Station E was 21.5% fines to a depth of 6.4 cm and classified as a dark grey clayey sand (SC) with trace shell fragments. From 6.4 cm to a depth of 30 cm the substrate at this station was 61.5% fines of olive grey sandy organic clay (OL) with shell fragments. Station F was analyzed to 36 cm as containing olive grey clayey sand (SC) with trace shell fragments and 45.0% fines. Station G was 67.0% fines and olive grey sandy organic clay (OL) with traces of shell fragments to a depth of 38 cm. These stations also exhibited an increase of grain size from Station G (67.0% fines) to Station E (21.5% fines at substrate surface), in correlation with distance from shore.

These sand over silt/clay substrates are indicative of erosional forces suspending and transporting the finer silt/clay components. This erosion can be attributed to tidal current scouring and wind induced wave energy. The area around Columbia Point in Dorchester Bay has a mean tidal range of 2.9 meters (9.5 feet) and a spring range of 3.3 meters (11 feet) (N.O.A.A., 1986) as reported for Castle Island at 42°20' latitude and 71°01' longitude. The combined currents for Dorchester Bay through Thompson Island has a 41.2 cm/sec (0.8 knot) maximum flood current running west by north (281° true) and a maximum ebb of 30.8 cm/sec (0.6 knot) running east 1/4 north (086° true). These velocities alone are not sufficient to cause silt suspension and restrict grain size offshore to sand classification. The probable cause of the sandy nature of the substrate in Stations A, B, E, and F is the occurrence of northeasterly wind fetch during storms from outer Boston Harbor, creating wave induced increases in bottom currents. These currents scour the substrate through the Dorchester Bay area, except where protected nearshore.

b. Chemical Characteristics

1. Sediment Chemistry

On 23 and 24 November 1985 sediment samples were obtained from seven stations in the vicinity of Columbia Point Massachusetts (see Figure A-1). The seven sites were sampled simultaneoulsy for sediment and elutriate chemistry testing. Subsequent analysis by NED described a generally sandy substrate with Category I, II, and III (A & B), levels of chemicals present, as defined by regulations of the Massachusetts Division of Water Pollution Control (1978). This testing is in agreement with the Susaki Associates (1983) report characterizing the general sediment quality of the South Boston harbor area. Chemical tests performed in 1979 by the Commonwealth and between 1972 and 1980 by the Corps indicate Category III and IIB material (Sasaki Associates, 1983) in this area. Appendix II includes all data on physical, chemical and elutriate analysis performed on sediments, of various depths into the substrate, obtained in 1985 by NED.

Sites A, B, C, and D (Pump House Station) were analyzed for those parameters listed in Appendix I. Comparison of these analyses to the MDWPC (1978) criteria for dredging or dredged material disposal classifies the proposed dredged material as having low levels (Category I) of volatile solids (NED method), oil and grease (PHC), arsenic and cadmium at all stations. The Pump House Station also contained moderate levels (category II) of % solids (D), mercury (D), lead (D), zinc (A, B & D), chromium (D), nickel (B) and Polychlorinated Biphenyls (PCB's) (A). High levels (Category III), of mercury (A, B, & C), lead (A, B, & C), zinc (B), copper (A & B), vanadium (D) and PCBs (B & C) were also present. Station D was predominantly silt/clay (90.5%) indicative of a MDWPC Type C classification.

Those Pump House Site station's chemical constituents of Category II or III averaged for all stations and depths are as follows (Note: SD is relative standard deviation between stations). Mercury averaged 2.1 ppm (S.D. = 2.2); lead averaged 660.9 ppm (S.D. = 1022.1); zinc averaged 207.0 ppm (S.D. - 223.2); chromium averaged 51.5 ppm (S.D. = 59.6); copper averaged 282.9 ppm (S.D. = 313.8); nickel averaged 29.0 ppm (S.D. = 19.2); and PCBs averaged 2,052.5 ppb (S.D. = 2463.9). Vanadium was not detectable at all stations except D, where it was 130 ppm. The instrument detection level for vanadium was 122 ppm approximating the Category II (75-125 ppm) and Category III (>125) level. A majority of these samples were Type A grain size, e.g. predominantly sand, averaging 45.3% fines (S.D. = 28.4).

Sites E, F, and G (Library Site) were also analyzed for those parameters listed in Appendix I. Comparison of these samples to the MDWPC (1978) criteria for dredging or dredged material disposal describe low levels (Category I) of all parameters except for Station E PCB (930 ppb) which was Category II. The average PCB concentration of all stations was

373.3 ppb (S.D. = 486.4). This average concentration reflects a Category I level for the overall dredging project. The silty nature of some sediments (Station E and G) classify two Type B samples, overall the project falls in the Type A category 49.0% silt (S.D. = 21.1).

In summary, the Pump House Site contains Type A sediments with Category II and III chemical constituents. The Library Site was predominantly Type A sediments with Category I chemical constitutes. This indicates a moderate level of chemical contamination has impacted the substrate at the Pump House Site. The Library Site has "very clean" sediment with low levels of all parameters, except for one moderate PCB concentration. The average concentrations of the Pump House Site (IIA and IIIA) are typical of South Boston Harbor sediments, although usually siltier (Sasaki Associates, 1983). The Library Site is atypical of this urban area, being essentially cleaner than most of the harbor. This difference between sites can be explained by the open exposure of the Library Site to wave action and current scour and the proximity of the Pump House Site to the historic barge loading area of the Columbia Point landfill.

2. Water Chemistry

Appendix I contains the results of the elutriate testing performed from sediment and water obtained at the two proposed project sites. The elutriate test assesses impacts of disposal and to some extent dredging, on the water column and the results are discussed in detail in Chapter 3 of this Assessment. In accordance with standard procedures (EPA/CE, 1977) of elutriate testing, disposal site water should be analyzed. Dredging site water was analyzed for this project because of the distance to the Foul Area Disposal Site. This analysis provides a baseline of water quality parameters for the project site. Project site water was analyzed in triplicate with a concurrent blank for quality control.

A comparison of the 1985 Environmental Protection Agency's Water Quality Criteria (29 July 1985) and the proposed Kennedy Library Dock's dredge site water is in Appendix I. The dredge site water was obtained in Dorchester Bay between the two proposed dredging sites. The analyses were triplicated and detected low levels, well below the criteria, for nitrates, sulfates oil and grease, phosphorus, mercury, lead, zinc, arsenic, cadmium, copper, nickel, barium, vanadium, and DDT. The three replicates of Polychlorinated Biphenyls (PCB) were 1.06 ppb, 1.18 ppb and 0.48 ppb. The Water Quality Criteria (EPA, 1985) describes an acceptable PCB level at any one time to be 0.03 ppb. The average of the December 1986 PCB concentrations was 0.91 (S.D. 0.37 or 40.7% relative). This elevated level of PCB concentration is the only water quality criteria that exceeds EPA's criteria in the Boston Harbor-Dorchester Bay sample.

The waters in Dorchester Bay are classified as SB (Personal communication, Mr. Slagle 1986 and MWRC 1978). The Massachusetts Water Resources Commission define class SB as:

"Waters assigned to this class are designated for the uses of protection and propogation of fish, other aquatic life and wildlife; for primary and secondary contact recreation; and for shellfish harvesting with depuration (Restricted Shellfish Areas)." (MWRC, 1978).

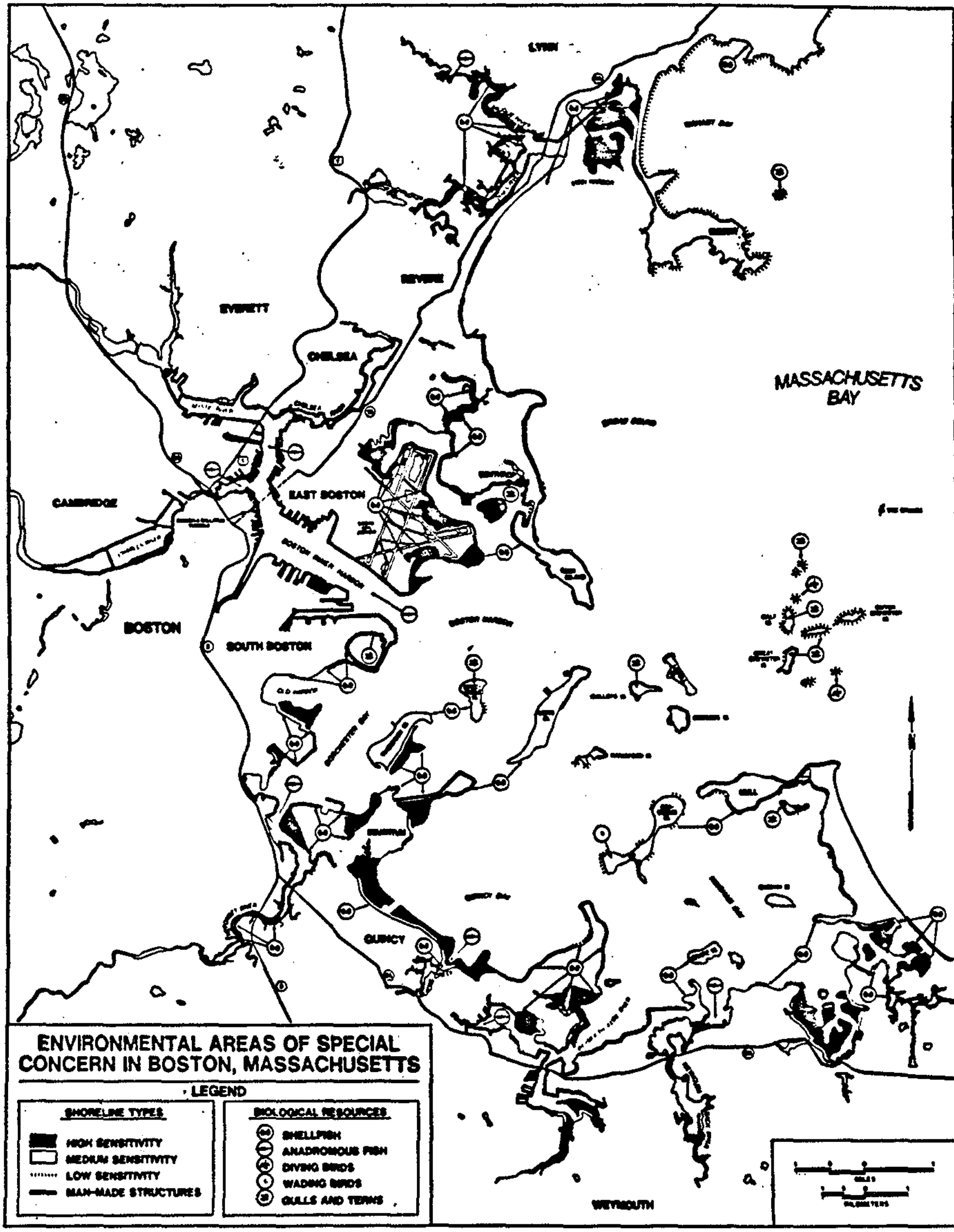
The parameters establishing this classification include aesthetics, radioactive substances, tainting substances, color, turbidity, total suspended solids, oil and grease, nutrients, dissolved oxygen, temperature, pH and total coliform bacteria. For these parameters measured for elutriate comparisons, the classification of the waters in this area of Dorchester Bay as SB is in good agreement with the data. PCBs are not used in this system, since they are assumed to be less than the EPA criteria. Additionally the MWRC (1978) document designates Dorchester Bay for use as marine fishery, shellfishing (restricted) and recreation (primary and secondary). The high level of PCB in the Dorchester Bay waters can be an anomolous occurrence. The blank sample run concurrently with these tests showed contamination (0.02 ppb of PCBs and 4.2 ppb of nickel). This analysis should not be construed as a definitive study contradicting the SB use classifications of the environment. The sampling was directed to analyze impacts associated with the proposed project.

C. Biological Characteristics

The two proposed project areas are located in Dorchester Bay, an area of South Boston Harbor (see Figure A-5). The coastal habitats present are estuarine intertidal rocky substrate and silty-sand subtidal substrate. To facilitate a description of the biological characteristics of the sites (Slobodkin et. al., 1980) scientific sampling was performed on site during three days of the winter of 1985-6. The results of this sampling comprise the biological report appendixed to this assessment (Appendix II). The following discussion summarizes this report.

The winter environments at the two proposed dredging/pier construction sites were described using four stations (see Figure A6) and a total of eight 1.0 liter hand cores (Stations 1 and 2) and thirteen 20cm x 20cm epifaunal grids excavated to 20 cm, where possible, for infaunal analysis. The results of these analyses have been discussed with local researchers (i.e. Dr. Gallagher - Univ. of Mass.) and seem to be in agreement with other data available for the area.

The benthic population data obtained by sieving through a 1.0 mm sieve can only be considered qualitative, since many of the smaller organisms will be washed through the mesh. Use of the 1.0 liter hand cores (0.5 mm sieve) provide a small aerial coverage (0.01 meter). It is also not possible to describe a benthic community by two (2) stations of four (4) replicates in the winter season. The data presented here on the communities is only analyzed statistically to allow the reader a numerical description of the data that can be compared between stations. In analyzing the variance between replicates of hand cores, Station 1 has good results, 18.9% relative variance in the number of individuals between cores and 5.1% between number of species. Station 2 has high variances; 60.6% relative variance in number of individuals between replicates; and 38.7% variance in number of species between replicates. The high variance in Station 2 data can be attributed to the low number of individuals and species recovered.



FigureA5. Environmental Sensitivity Index Map of the Boston Area

(NOAA, 1984)

FIGURE A-5

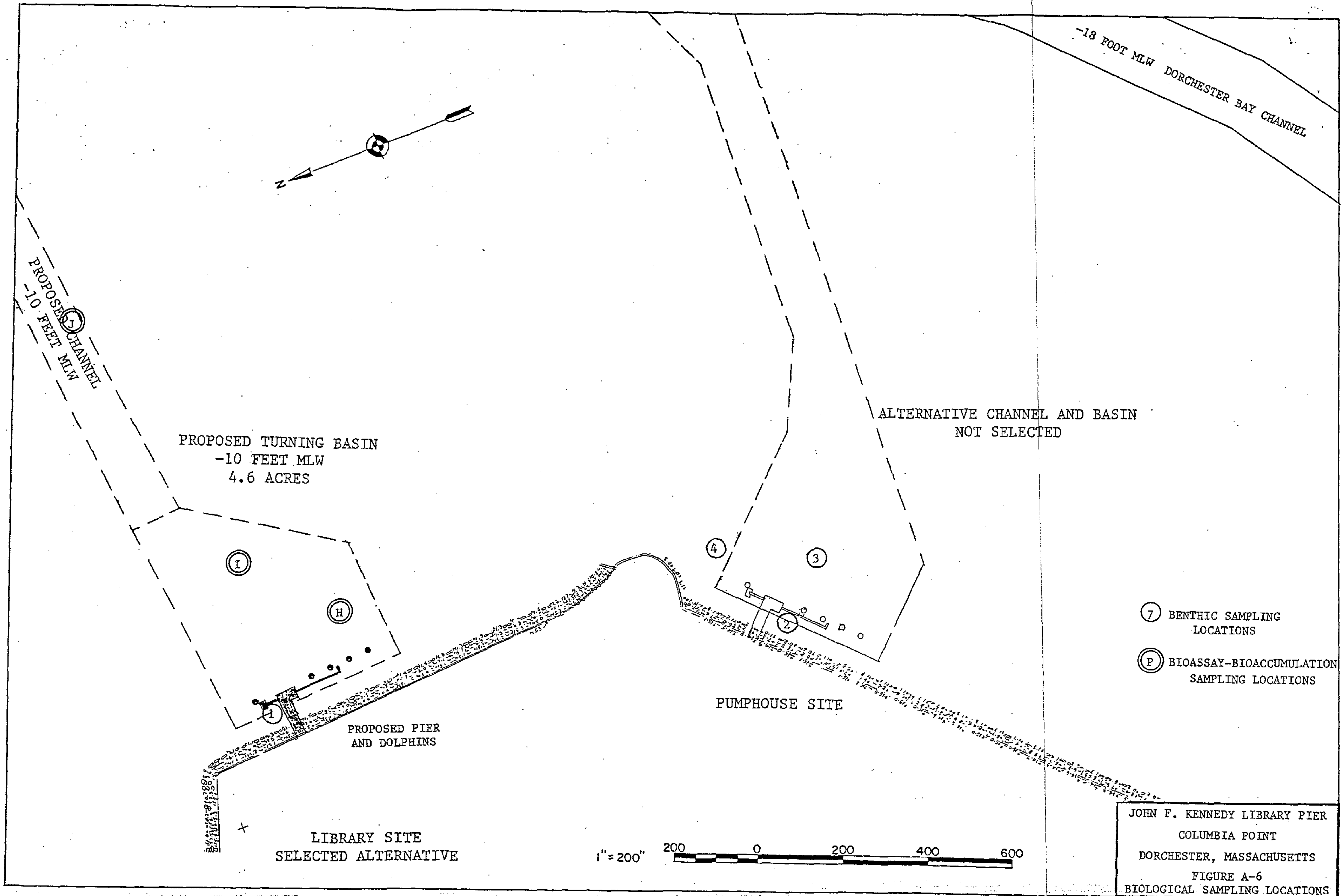


FIGURE A-6
BIOLOGICAL SAMPLING LOCATIONS

The benthic fauna at Station 1 averaged 21,325 individuals per square meter from 14 species. The dominant organisms were the oligochaete Peloscolex benedeni (8550/m^2); the polychaete Capitella capitata (identified here as one species: 3700/m^2); the polychaete Streblospio benedicti (2875/m^2) and the gastropod Crepidula fornicata (2050/m^2). A varied population of crustaceans was also represented (Appendix II - Table 7). Calculation of the Shannon Diversity Index revealed an H' (Shannon Diversity) of 0.7556 and an Evenness (J') of 0.6592. These indices depict a moderately even distribution of individuals among species, maximum homogeneity (Evenness) would approach 1.0, J' at this station was 0.6592.

The epifaunal community, associated with the rocky intertidal substrates covered with mussels and algae such as Fucus vesiculosus and Chondrus crispus, was dominated by the suspension feeding gastropod Crepidula plana, the flat slipper shell, at approximately 962.8 per square meter. The blue mussel Mytilus edulis was found to be the next dominant at approximately 390.1/m^2 with an average length of 5.5 cm (S.D. = 0.9). The third dominant organism was the slipper shell Crepidula fornicata approximately 257.3/m^2. These organisms are typically associated with mussel beds, the suspension feeding gastropods existing commensally with Mytilus edulis.

The nutrients necessary to maintain a suspension feeding community are filtered by all three dominants from the water column. This activity is possible by the currents providing a constant flow of nutrients across the bed, while also not allowing silts to accumulate on the bed. Siltation could clog the gills and feeding structures of the suspension feeding organisms. The bed itself is formed as a mat above the substrate collecting feces below by reducing currents flowing across the substrate. The dominants of the benthic infaunal community are often found in association with each other (Pearson and Rosenberg, 1978), each having the ability, as a species, to exploit environmentally stressed niches. The dominants (Peloscolex benedeni, Capitella capitata, and Streblospio benedicti) are annelid oligochaetes and polychaetes that digest the substrate's detrital/organic component (e.g. non-selective deposit feeders) as they burrow through the sediment.

The H' diversity and J' Evenness of this site and the presence of crustaceans (approximately 2000/m^2) indicates that although stress tolerant species have successfully exploited the environment, as they can exploit most environments, a generally healthy community exists here. The detrital organic input from the mussel beds may provide the dominants with an advantage in competing with other community members. The definitive description of complex community interactions such as this require seasonal monitoring through a long time frame. From this one-time sampling, we can only infer that the populations of benthos at the Library Site are not unique and if disturbed (i.e. dredged) recolonization will occur from ambient Boston Harbor environments, by both larval and adult recruitment, within a series of spawning seasons, culminating in full recolonization over approximately one year.

The macrobenthic infaunal community at the Pump House Site, Station 2 was characterized by analyzing four one liter ($0.01m^2$) hand cores. Appendix II - Table 6 lists the results of the laboratory analyses and Appendix II - Table 8 approximates the density of organisms per square meter.

The benthic community sampled by the replicate hand core at Station 2 averaged 3,925.0 organisms per square meter from four species. The dominant organisms were the oligochaete Peloscolex benedeni ($2,225/m^2$), the polychaete Capitella capitata ($1,575/m^2$) and the polychaete Streblospio benedicti ($100/m^2$). These three species are dominant over Littorina littorea ($25/m^2$). Calculation of H' reveals moderate values; H' = 0.3535 and J' = 0.5871, reflective of the four species present at the site.

The Pump House Site macrofaunal component sampled by ten 20 cm by 20 cm epifaunal grids, excavated where possible to 20 cm, was dominated by the blue mussel Mytilus edulis at approximately $27.0/m^2$ (mean length = 4.2cm) and the common periwinkle at a density of approximately $18.5/m^2$. The other species recovered were generally single occurrences that cannot be considered dominants. The presence of Mytilus edulis and Littorina littorea is a function of these species exploiting the rocky and coarse sandy intertidal substrate.

The low numbers of individuals and the narrow diversity of species (Peloscolex benedeni, Capitella capitata and Streblospio benedicti) at the Pump House Site, as compared to the Library Site, indicates a more stressful environment at the Pump House Site. These three annelids, in low numbers, are the entire benthic community, not having the diversity that the crustaceans provide at Station 1.

The tolerance of these species to stresses of high organic/low oxygen concentration, physical alterations to their environment and various contaminant concentrations is a function of the high spawning rate, tolerant larval stages and successful larval recruitment in stressed environments. For these reasons, this species complex is often characteristic of urban estuaries. Through time, as urbanization in some coastal habitats has impacted water quality, certain species have evolved to successfully exploit stressed niches, out competing other, less tolerant species. The specific stresses controlling the benthic population structure can only be theorized from this limited sampling. The chemical characteristics determined for the Pump House Site (see Section E1 of the Environmental Assessment) are significantly more contaminated than the Library Site and therefore suspect as the most probable controlling factor.

Although Dorchester Bay has areas of significant clam densities (Mya arenaria) (see Figure A-5), only one individual was collected among all stations and replicates during this sampling program. The density of Mya arenaria clams at either site is therefore not assumed to be significant.

Some finfish of Dorchester Bay probably forage the mussel bed intertidal areas at high tides preying on the Mytilus edulis and associated organisms. As the tide ebbs, the subtidal populations of benthic organisms become important prey. Chesmore et. al. (1971) conducted the most recent survey of the finfish resources of Dorchester Bay. Twenty-one species of finfish were captured in Dorchester Bay during this sampling, including dogfish (Squalidae); herring (Clupeidae); smelt (Osmeridae); eels (Anguillidae); Killfish (Cyprinodontidae); cod and hakes (Gadidae); sticklebacks (Gasterosteidae); sea basses (Serranidae); sculpin (Cottidae); lumpfish (Cyclopteridae); eelpouts (Zoarcidae); silversides (Atherinidae); mackerel (Scombridae); and flounder (Bothidae and Pleuronectidae).

Lobster (Homarus americanus) are seasonal foragers to nearshore embayments but are not expected in large numbers in the proposed project sites, preferring subtidal rocky crevices.

Avifauna observed during the three sampling efforts at Columbia Point includes blackback gulls, herring gulls, horned grebe, black duck, mallard, northern pintail, greater scaup, and common goldeneye. These organisms were not observed foraging on the project site.

2) Disposal Site

a. General

The material dredged from the proposed project site will be placed on a barge and transported approximately 25 nautical miles east to the Foul Area Disposal Site. This disposal will require approximately fifty to one hundred (50-100) round trips, depending on the barge capacity, from Columbia Point to the disposal bouy.

The site, located in Massachusetts Bay (see Figure A4) in 100 meters of water, is an Environmental Protection Agency (EPA) approved interim site with a circular boundary of two nautical miles diameter as identified in the Federal Register as Marblehead (40 CFR 228.12). The center of the site is at 42^{o}-25.7' north latitude and 70^{o}-34.0' west longitude, approximately 14.5 nautical miles southeast of Manchester Bay, Manchester, Massachusetts, 26 nautical miles northwest of Race Point, Provincetown, Massachusetts and 10 miles south southeast of Eastern Point, Gloucester, Massachusetts. This disposal site is locally called the Foul Area because of the many fishing net "hangs" that could foul the equipment.

The general vicinity of the Foul Area Disposal Site (FADS) has received wrecks, dredged material, organic and inorganic compounds and construction debris since the 1940's. Earlier disposal was not at a specified point, but sufficiently far from land to reduce the impacts of disposal. Most dredged material was disposed at sites closer inshore, especially the "Boston Lightship Disposal Site". Some dredged material that was considered 'contaminated' (without any real testing) or oil laden was disposed at the offshore area eventually termed the "Foul Area." Often Boston Harbor dredged material, including Dorchester Bay, has been disposed at the Foul Area Disposal Site because of the silt content of the substrate.

The disposal or A buoy, for point discharge, was deployed at 42°-26.7' N and 70°-35.0' W from 1947 through 1975. In 1975, at the request of the Commonwealth of Massachusetts, the buoy was moved to the present location (42°25.7' N and 70° 35.0' W). In 1977, the Ocean Dumping Regulations (40 CFR 220-229) established an overlapping 2 nautical mile diameter circle centered 1 nautical mile east (42°-25.7' N and 70°-34.0' east W) of the previous site to receive dredge material. This site has received approximately 3 million cubic yards of dredged material between 1975 and 1986, a majority of which came from Boston Harbor dredging projects. FADS has received dredged material of varying composition from those harbors listed in Appendix I. The silty sand and sandy silt proposed to be dredged from Dorchester Bay is typical of the materials deposited at FADS.

Often the material that clogs channels and harbors in New England is fine grained sediments that are not suitable for fill, beach nourishment or other constructive practices. The establishment of the channel for John F. Kennedy Presidential Library access also dedicates the area to be "maintenance" dredged as silts settle in the new channel. Originally, this material is transported by river bedload, stormwater runoff and tidally driven currents to settle in areas of low current velocities. This settling creates shoals that must be periodically dredged to ensure the safety of vessels navigating the channel and anchorages.

The silt and silty sand that needs to be disposed from this project area during construction and subsequently as maintenance dredging occurs must have a low energy environment for stability in containing the disposed material (especially silt) within the designated site. During the past disposal activity at FADS, 62.1% of all material was silt and clay (greater than 4 phi) and 37.3% was sand (-1 to 4 phi) the remaining 0.6% was gravel (less than -1 phi). Much of the material disposed was a mixture of sandy silt, as with this project. The Foul Area Disposal Site has received this material because of the stable nature of this deepwater offshore site. Nearshore disposal could allow storm activity to resuspend dredged silt and clays. Upland disposal sites are few and expensive on this urban coastline. The majority of material at FADS, in cubic yardage, has come from Boston Harbor (67%) with harbors south of Boston comprising 20% of the material historically disposed at FADS. The remaining 13% was generated from dredging projects in harbors north of Boston to Gloucester, Massachusetts. The composition of chemical and biological parameters at FADS is a product of these disposals. The New England Division, U.S. Army Corps of Engineers, has the responsibility to manage and monitor the disposal of dredged material at this site. NED is currently conducting oceanographic studies of FADS that will be used to determine whether the interim site can be designated as a permanent EPA approved dredged material ocean disposal site.

b) Physical and Chemical Characteristics

Preliminary results of NED's oceanographic studies indicate the site to be located in a low energy, deepwater environment, allowing containment of dredged material within the site. The disposal buoy is at a 100-meter deep portion of the site, where bottom currents are less than 35 cm/sec (SAIC, 1984). Analysis of a hopper dredge disposal, which disposed a mixture of water and dredged material in a slurry, defined a disposal plume settling within a circle of a 350-meter radius.

The physical properties of the substrate near the disposal point is varying in composition, predominently sandy silt, reflecting the various harbor dredging projects disposed here. The natural bottom covering the majority of FADS, e.g. areas of the site that have not received dredged material, is a fine silt/clay substrate (NED unpublished data). The composition of this natural material indicates the basin is a depositional area capable of containing the dredged material. If sufficient currents frequented this area of the basin, the fine grained material would be suspended and transported with the current. Areas of high current velocities would therefore have a coarse grained (heavier than silt/clay) substrate.

A summary of the chemical composition of 25 stations from FADS is presented in the DAMOS (Disposal Area Monitoring System), 1984 Program Results Document (SAIC, 1985). The actual tables of results are included in Appendix I of this report. In general, the April 1983 chemical concentrations of the substrate at FADS can be categorized as Types IA and IIA. Percent volatile solids averaged 3.3% (S.D. = 0.1) which is Type A. Oil and grease concentrations measured 1785.3 ppm (S.D. = 1102.8) classified as Type A. Chromium averaged 152.0 ppm (S.D. = 75.1) and this metal concentration is considered Category II. The metal zinc averaged 235.8 ppm (S.D. = 73.3) and is also Category II. Copper concentrations in FADS sediments were in Category I of 64.8 ppm (S.D. = 32.7). Arsenic concentrations were averaged as Category I, 9.8 ppm (S.D. = 3.4); and the standard deviation exhibited a range into the Class II category. Earlier cruises in January 1983 analyzed mercury and lead at FADS at nine stations (SAIC, 1985) and found Category I lead and mercury levels of 44.2 ppm (S.D. = 18.0) and 0.11 ppm (S.D. = 0.04) respectively. All other levels were comparable or less than the April 1983 values except percent volatile solids (4.3, S.D. = 1.9). No PCB concentrations were reported; however indications from present studies define spatial variability in concentrations ranging from Category I through III.

c) Biological Characteristics

Recent sampling of the benthos at the Foul Area Disposal Site (S.A.I.C., 1986) described three distinct community assemblages as occurring. These assemblages reflect the various sediment facies within the site.

The northeast section of the site has an unimpacted coarse sand and gravel composition. The benthic community was sampled in the Fall of 1985. This assemblage was numerically dominated by the Syllidae polychaete Exogone verugera profunda ($907/m^2$); the Paraonidae polchaete Levinsenia gracilis ($350/m^2$); and the Spionidae polychaete Prionospio steenstrupi ($313/m^2$). A total of 105 species averaging 4,433 organisms per square meter were recovered.

The western portion of the Foul Area Disposal Site has been impacted by continued diposal of dredged material from the greater Boston region. Approximately 3 million cubic yards per decade of material is disposed in this section of FADS. This continual disturbance of the bottom maintains the community of benthic organisms in a dynamic equilibrium. The most adaptable species proliferate. Those species that reproduce rapidly and have high numbers of offspring (i.e. larvae) colonize the newly disposed dredged material (r-strategists of classical ecology) and biogenically rework the substrate. Given time, this pioneering community would alter the sediment character and allow a more mature community to develop. The frequent disposal activity maintains the resident population of the disposed material area as a pioneering sere. This assemblage at FADS was dominated (Fall 1986) by oligochaetes ($6,293/m^2$); the Spionidae polychaete Spio pettibonae ($4,607/m^2$); the Cirratulidae polychaete Chaetozone setosa ($2,160/m^2$); and the Capitellidae polychaete Mediomastus ambiseta ($1,757/m^2$). A total of 78 species averaging 25,467 organisms per square meter were recovered.

The southeastern section of FADS has an unimpacted silt-clay sediment facies. The lack of physical disturbance (burial) by disposal of dredged material has allowed a mature benthic assemblage to become established. Interspecific competition within a mature community results in a presence of considerably lower densities of individuals (e.g. $8,390/m^2$) than found in continually disturbed habitats (e.g. $25,467/m^2$). The undisturbed southeastern section of FADS was dominated by the Paraonidae polychaete Levinsenia gracilis ($1,583/m^2$); oligochaetes ($1,050/m^2$); and the Capitellidae polchaete Mediomastus ambiseta ($693/m^2$). The Fall 1985 sampling in this section of FADS recovered a total of 57 species averaging 8,390 individuals per square meter.

Various finfish species have been collected during recent sampling cruises (S.A.I.C., 1986) within the Foul Area Disposal Site. In the spring of 1985, the spiny dogfish Squalus acanthias was the dominant finfish recovered. This species migrates seasonally in large schools. Those sampled at FADS were found to be feeding on flounder, sculpin, and anemones. Fall 1985 finfish collections were dominated by the witch flounder or grey sole Glyptocephalus cynoglossus and the dab or american plaice Hippoglossoides platessoides. The former was found to be foraging on polychaetes (e.g. Chaetozone sp.; Spio sp.; Sternapsis sp. and Tharyx sp.). The latter was found to be foraging on brittle stars (Ophiuroidea). The Foul Area Disposal Site is approximately 5.5 kilometers west of a submerged (30 meters deep) topographic rise called Stellwagen Bank. This bank is a known feeding area for various marine mammals including the Humpback whale Megaptera novaeangliae and the Fin whale Balaenoptera physalus. These and other marine mammals have been observed in the vicinity of FADS.

3) Threatened and Endangered Species

The intertidal and subtidal areas adjacent to the Columbia Point area are not known habitat for any threatened or endangered species. The Foul Area Disposal Site is located in Massachusetts Bay, an area known to be utilized by various marine mammals. The impact of the use of FADS on endangered species is currently being assessed by the New England Division of the Corps of Engineers. The interim status of this site as an area for dredged material disposal assumes no impact on endangered species. Full coordination of this assessment with National Marine Fisheries Service and the U.S. Fish and Wildlife Service ensures compliance with the protection of endangered species and their habitats. (Also see Coordination Section.)

4) Ecologically Significant Species

The dominant organisms recovered at both sites include the blue mussel Mytilus edulis, the oligochaete Peloscolex benedeni and the polychaete Capitella capitata. Avifauna frequenting the site include sea ducks and gulls. Tidal flats in areas near Columbia Point are known to contain populations of the clam Mya arenaria (pers. comm. Mass. Div. Mar. Fish and Chesmore et. al, 1971), only one was recovered during three sampling days at the site. It is assumed that if Mya arenaria are present in the project area, they are in low density (see also Biological Report - Appendix II). The winter flounder Pseudopleuronects americanus is also anticipated to forage in the proposed project area. The soft-shell clam is known to spawn from mid-June through mid-August north of Cape Cod (NMFS, 1980). Winter flounder are known to spawn when water temperatures drop below 10°C (50°F) or approximately March through May.

Two communities are interacting on site, the mussel bed and its associated fauna; and the Peloscolex benedeni: Capitella capitata communities. The mussel beds attach by byssal threads to hard substrates, expanding into a mat by attaching to each other. The shell/byssal thread complex is inhabited by various species and the underlying substrate is allowed to stabilize and accrue silts and fecal material from the mussel bed.

5) Historic and Archaeological Resources

The Calf Island Pump Station, which is considered eligible for listing in the National Register of Historic Places, is located on the shore adjacent to the project area. No other significant archaeological or historical resources are known to exist within or adjacent to the project area.

6) Social and Economic Resources

The perimeter of Columbia Point, from Morrissey Boulevard to the Kennedy Library has a walkway and bulkhead lined with a balustrade. This promenade contains benches and lights and is open to the public. A strip of shoreland/upland vegetation separates the coastal walk from the road. The road serves the University of Massachusetts Boston Campus, the John F. Kennedy Library and the presently under construction Massachusetts Archives Building. Separating these three facilities are large grassy malls and various parking facilities.

The current plans for Columbia Point call for the Boston Redevelopment Agency to demolish some of the vacant buildings adjacent to the Archives/Library/University sites and potentially develop a new harborfront park (MCZM, 1983). The area where the potential ferry service is to be established, is served by the "Red Line" Columbia Shuttle to both the university and library. Given the present access and future plans for use, the establishment of a ferry service will link a valuable tourism resource to the outer harbor attractions. The water bus will allow residents using the "Red Line" mass transit to enter the tourist route and allow tourist access to mainland routes. On the water bus service, it is proposed to have stops linking attractions including the Paul Revere House and Old North Church; the Constitution and its adjacent museum; the New England Aquarium and Quincy Market; the Children's Museum; the Computer Museum; and the Tea Party Ship.

Additional dockage may be provided for a research vessel suitable for the needs of the University of Massachusetts Marine Sciences Program. The berth may also serve transient research vessels (i.e. National Science Foundations Research Vessels Cape Hatteras or Cape Cod). The present lack of vessel dockage inhibits the universities marine research efforts. Additionally shore facilities and storage would be necessary to fulfill the need of the UMass Marine Sciences Program.

The dock will also serve as a recreational area in conjunction with the present walkway for biking, strolling, and fishing.

F. Environmental Consequences

1) Dredging Site and Pier Construction

a. General

The dredging of a channel 640 meters (2100 feet) long by 36 meters (120 feet) wide and a 4.7 acre turning basin to a minus three meter (-10 foot) mean low water depth, will generate approximately 70,000 cubic yards of material. This material will be excavated by a clamshell dredge and loaded onto barges. The dredging activity will take approximately two months. The act of dredging this channel dedicates this area for periodic maintenance dredging. The effects of these actions will impact the physical, chemical and biological components of Dorchester Bay by resuspending sediments during dredging.

The preliminary analysis of alternative sites for the channel and pier describe the Library Site as being the preferred alternative. The high concentrations of chemical contaminants at the Pump House Site may adversly impact the environment by suspension of contaminants during dredging. These same high concentrations may also have significant effects at the disposal site. The results of a priority pollutant scan on the Library Site sediments substantiate the relatively uncontaminated nature of the sediments (see Appendix A-I). This assessment, therefore, will discuss the Library Site henceforth, since it has been determined to be the only viable alternative based on the chemical characteristics of the sediment to be dredged.

b. Physical and Chemical Effects.

The dredging of sediments from the proposed John F. Kennedy Library dock access channel will suspend sediments that are excavated and overflow the dredge bucket. This sediment suspension will result in increased sediment load in the water column. The underlying sediments exposed will be temporarily unstable and oxygen depleted at the sediment/water interface. Subsequent physical and biological activity will stabilize and oxygenate the substrate.

Mechanical bucket dredging activities excavate a majority of the substrate in a cohesive mass; only a small percentage of the dredged material becomes suspended in the water column. This suspended material is restricted to the silt or clay fraction (>4 phi) with sand particles (<4 phi) settling out immediately after suspension. Grain size analyses of three stations at the Library Site (see Appendix I) identify the substrate as sand over clay at Station E, sand at Station F and clay at Station G. Dredging effects would therefore be less than expected for pure silt/clay.

Bohlen (1979) analyzed the effects of dredging a silt/clay substrate in New London Harbor, Connecticut. This research concluded the effects of suspended silt on water quality to be of short duration and localized to the immediate dredge site. While suspended, silt increases water turbidity levels. High turbidity reduces vision and masks odors important to foraging organisms. Suspended silt may also clog or abrade gill structures and interfere with the feeding mechanisms of filter feeders. The usually high organic content of silt/clay material may depress ambient oxygen concentrations, but chemical oxygen demand averaged for Stations E, F, and G were low (average of all depths = 17,191.7 ppm; S.D. = 7,184.2). Increased turbidity would reduce light penetration lessening primary productivity and therefore oxygen release from photosynthetic processes could be reduced. Finally, upon settling, the suspended sediment load, both sand and silt/clay could cover non-motile organisms (see C. Biological Effects). All of these effects are expected to be spatially and temporally limited.

During various dredging operations, scientific analysis of the spatial and temporal persistence of the turbidity/organic plume has been quantified. In the summer of 1977 the extent and duration of the impacts from dredging the Thames River/New London Harbor channels were studied (Bohlen et. al., 1979). This material was predominantly silt/clay (>4 phi). The conclusions of this study defined the plume of suspended materials from the dredging operation as having a maximum extent of 700 meters downstream. Analysis of the composition and concentration of the plume indicated the majority of material suspended occurred within 30m of the dredge. Suspended material concentrations ranged form 200 mg/l to 400 mg/l resulting from suspension of approximately 1.5 to 3.0% of the substrate in each bucket load. Suspended material concentrations were reduced by a factor of ten within the first 200 meters downstream of the dredge. Mid-water and near bottom concentrations returned to background levels 700 meters downstream of the dredge. All values were significantly less than storm induced perturbations that occur on an average of 1 to 3 times yearly in this harbor.

All of the effects associated with increased turbidity would occur in the immediate area of the dredge, be transported by currents and settle. After completion of dredging activity, these impacts will cease. The motile organisms will escape these impacts by leaving or avoiding the activity area. The remaining organisms will be impacted. These organisms are estuarine species that are tolerant of many stresses and will be able to tolerate the associated turbidity impacts (see C. Biological Effect).

One of the functional characteristics of an estuarine system, such as Dorchester Bay, is to serve as a nutrient retention area, increasing the productivity of its subcomponents. Nutrients are effectively "trapped" in the sediments where they are stored. This trapping and storage function also allows for the retention of pollutants in the same substrates, especially in fine grained sediment which have a larger volume of surface area for pollutant adsorption. The physical removal of these sediments by dredging operations has the potential to release some of the sediment bound pollutants.

A clamshell or bucket dredge would be used to excavate the channel. This type of dredging allows the substrate to remain in a clump or cohesive mass minimizing the suspension or elutriation of sediments. There would not be any opportunity for significant releases of toxics into the Dorchester Bay system, since the dredging operation would be of relatively short duration and tests indicate significant pollutant concentrations do not exist in the material to be dredged.

One group of pollutants that have been of concern for environmental quality analyses are metals such as mercury (Hg), cadmium (Cd), Chromium (Cr), lead (Pb), copper (Cu), and zinc (Zn). Recent studies have shown that even when metals are found in high concentrations, there does not exist a corresponding substantial release of free (non-bound) metals from resuspension of bottom sediments during dredging. Studies performed by the Corps of Engineers Dredged Material Research Program concluded that certain trace metals may be released in the parts per billion (ppb) range, while others show no release pattern (Chen, 1976). Chen (1976) also showed that heavy metals are not readily soluble or excessively mobile through a system since they are usually adsorbed to sediments or coprecipitated out of solution.

Other classes of toxicants that are of concern are PCB's (Poly Chlorinated Biphenyls), PHC's (Petroleum Hydrocarbons) and DDT (Dichloro-Diphenyl-Trichloethane: a chlorinated pesticide). The presence of these chemicals were analyzed by elutriate and bulk chemical testing as described in Section E of this report. Fulk et. al. (1975) demonstrated the solution of pesticides from bottom sediments into the water column during dredging is not significant. Petroleum Hydrocarbons (PHCs) are a by-product of industrialization of estuarine areas and are detrimental to the ecosystem only when released in very high concentrations. The concentrations of PHC's in the Library Site's substrate can be assumed low, given an average % volatile solids concentration of 1.08% (S.D. = 0.35). The only toxicant concentration of concern was the moderate (Category II) PCB level at Station E of 930 ppb. The average of the three sites was 373.3 ppb (S.D. = 486.4). These concentrations in the sediment do not necessarily imply the PCBs will be dissolved into the water column.

Potential for release of sediment contaminants during the dredging and disposal processes can be effectively evaluated by using the standard elutriate test. These tests are defined in the Environmental Protection Agency and the Corps of Engineers document: "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters" (1977).

In November 1985, elutriate tests were performed on sediment samples taken in the Library Site. This test mixes one part sediment with four parts seawater and vigorously agitates the slurry for 30 minutes. After settling for one hour the filtered elutriate is analyzed for sediment release of contaminants. Levels of contaminants are quantified, but since a bucket type dredge will be used, this method describes the worst case scenario for both dredging and disposal.

The results of the elutriate tests for the library site are listed in Appendix I. In general, the results indicate the potential for release of (elutriation above ambient water concentrations) phosphate (total and ortho, mean elution = 0.086 ppm; S.D. = 0.12 and 0.076 ppm; S.D. = 0.06); zinc (mean elution = 10.20 ppb; S.D. = 9.0); arsenic (mean elution = 4.93 ppb; SD. = [illegible]); copper (mean elution = 0.48 ppb; S.D. = 0.74); nickel (mean elution = 1.77 ppb; S.D. = 2.4); barium (mean elution = 32.2 ppb; S.D. - 29.3); vanadium (mean elution = 39.3 ppb; S.D. = 12.3); and PCBs (mean elution = 0.77 ppb; S.D. = 1.3). These values are averaged for three stations. The potential to release chemicals is based on an elutriation release above ambient concentrations. The only values that were found to produce concentrations above EPA Water Quality Criteria (EPA, 1985) in a single replicate were total phosphorus and ortho-phosphorus (Station G, replicates 1 and 2) and PCB (all stations, all replicates). The only average value above EPA water quality criteria was PCB (mean elution - 0.77 ppb; S.D. = 1.3). The water analyzed from the site contained a greater average value (0.91 ppb) than the elutriate test average (0.77 ppb). Therefore, taken as average values the maximum possible PCB elutriation would not exceed ambient water quality concentrations. These values are not implicit since the distilled water blank, run concurrently with the water collected on site, contained 0.02 ppb of PCB, indicating sample contamination.

The dredging of the channel would remove a majority of the substrate in a cohesive mass, prohibiting the possibility of elutriation of all contaminants. A review of the low levels of sediment chemistry; the low elutriation of contaminants above ambient concentration and the use of a bucket or clamshell dredge, indicates no potential exists for significant degradation of ambient water quality during dredging.

The construction of the pier and dolphins will minimally impact the environment. The placing of support pilings into the substrate will replace the sandy substrate with hard substrate (piling) for the diameter of the pylon. The loss of productivity associated with soft substrate (approximately 9.1 m^2 or 101 ft^2: dolphins - 4.3 m^2 (48 ft^2) and pilings - 4.8 m^2 (53 ft^2)) will be offset by the increased hard substrate surface area. The pilings will provide suitable substrate for epifaunal organisms to colonize (approximately 182.3 m^2 or 2025 ft^2: dolphins = 170 m^2 (1884 ft^2) and pilings = 12.7 m^2 (141 ft^2)), adding to the diversity of niches in the environment. The chemical effects will be minimal, associated with sediment suspension during construction (i.e. pile driving, prop wash from work boats, etc.). Physically, minimal impact will be realized from minor current deflections and shading from pilings and deck.

c. Biological Effects.

The dredging of 70,000 cubic yards of substrate from the Columbia Point area destroys benthic habitat and associated organisms by physical removal. Recent investigations (Van Dolah et. al., 1984) in other estuarine systems have shown these effects short-lived (3 months). The loss of productivity from these habitats is short term since faunal recolonization will occur. Pioneering organisms will dominate the disturbed habitat and biogenically rework the substrate. After a few seasons, seral successions will occur and increasing numbers of species will inhabit the area until the pre-dredging benthic community structure will be obtained. The predredging benthic community (see E1. Biological Characteristics) was found to be dominated by organisms that predominantly spawn over winter. Larval recruitment of benthic organisms (larvae successfully settling on and inhabiting the substrate) will occur from adjacent populations of similar organisms. These adjacent populations have been identified in this survey (Pump House Site) and other research (Savin Hill Cove). The oligochaete *Peloscolex benedeni* and the polychaetes *Capitella capitata* and *Streblospio benedicti* can be expected to rapidly recolonize the dredging site. Recent scientific investigations (Pearson and Rosenberg, 1978) have identified these species as having the ability to inhabit a variety of substrates that would normally prove stressful to other species.

During the recolonization period, there will be a large number of individuals from a few benthic species. Subsequent populations will recruit a greater number of species, having fewer individuals. Concurrent with this transitional stage the substrate will be biogenically reworked until it becomes properly aerated and suitable for colonization by more species. It is the large numbers of pioneering benthic species that biogenically rework the substrate in a short time frame. The organisms are also an important source of forage for juvenile finfish. The dredging of the channel will cause a short term loss of benthic productivity that will be rapidly offset through faunal recolonization.

Photosynthetic processes and associated productivity will be decreased during high periods of turbidity. This reduction in primary production will be temporary. Sediment suspension will also displace motile species avoiding gill abrasion, lower oxygen levels and reduced sensory opportunities for predation (masked odors and low visibility) in the dredging area. These would all be temporary and insignificant effects. The pier construction will provide an increase in habitat diversity along Columbia Point although the construction of the piling pier will destroy benthic organisms that are under the pilings.

2. *Disposal Site*

a. General

The material dredged from the Library Site of the proposed channel dredging will be placed on barges and transported (approximately 50-100 trips) to the Foul Area Disposal Site (see Figure A4). The disposal will occur by bringing the barge to a complete stop at a predescribed point. This disposal point will be marked by a buoy positioned by the New England Division. The discharge will occur in approximately 100 meters of water.

This site has been extensively studied by the New England Division of the U.S. Army Corps of Engineers. Precision bathymetry, sediment grab sampling and REMOTS image analysis (sediment profiling) have assisted in characterizing this site as a low energy environment suitable for dredged material disposal and containment. Additional oceanographic sampling is currently being conducted in reviewing the interim ocean disposal site status of this site.

b. Physical and Chemical Effects

A turbidity plume will be created by the disposal of the dredged material. The release of contaminants adsorbed to these sediments should be no greater than those values determined by the elutriate testing. The values will be considerably less for the turbidity plume, since most of the material will remain consolidated. This impact on the disposal site will be short lived.

The results of the elutriate tests for the Library Site are listed in Appendix I. These tests compared the elution potential of dredged material to dredging site water, not Foul Area Disposal Site water. In general, the results indicate the potential for release (above ambient - Dorchester Bay - water concentrations) of phosphate (total and ortho, mean elution = 0.086 ppm; S.D. = 0.12 and 0.076 ppm; S.D. = 0.06); zinc (mean elution = 10.20 ppb; S.D. = 9.0); arsenic (mean elution = 4.93 ppb; S.D. = 4.78); copper (mean elution = 0.48 ppb; S.D. = 0.74); nickel (mean elution = 1.77 ppb; S.D. = 2.4); barium (mean elution = 32.2 ppb; S.D. = 29.3); vanadium (mean elution = 39.3 ppb; S.D. = 12.3); PCB's (mean elution = 0.77 ppb; S.D. = 1.3). These values are averaged for three stations (E, F, and G). The potential to release chemicals is based on an elutriation release above ambient concentrations. The only average value above EPA water quality criteria was PCB (mean elution - 0.77 ppb; S.D. = 1.3). The water analyzed from the site contained a greater average value (0.91 ppb) than the elutriate test average (0.77 ppb). Therefore, taken as average values, the maximum possible PCB elutriation would not exceed ambient Dorchester Bay water quality concentrations. The Foul Area Disposal Site is an open water site and therefore the ambient water chemistry can be assumed lower than Dorchester Bay. The 0.77 ppb elution would be quickly dispersed given the 100 meter depth of the water column. These values are not implicit since the distilled water blank, run concurrently with the water collected on site, contained 0.02 ppb of PCB.

The dredging of the channel would remove a majority of the substrate in a cohesive mass, prohibiting the possibility of elutriation of all contaminants. A review of the low levels of sediment chemistry, the low elutriation of contaminants above ambient Dorchester Bay concentration and the use of a bucket or clamshell dredge, indicates no potential exists for significant degradation of disposal site water quality. The values listed do not exceed EPA Water Quality Criteria (1985) except for PCB as explained. The impacts associated with disposal of dredged sediments can be estimated by the use of a bioassay/bioaccumulation test. The results of this test (see Appendix III) are discussed (in c. Biological Effects) below.

Recent studies (DAMOS, 1985) concluded the concentration of suspended materials in the turbidity plume, following disposal, will be no greater than 5 to 12 mg/l, forty minutes after disposal. These studies were conducted at the Foul Area Disposal Site in Massachusetts Bay with hydraulically dredged material disposed in 100 meters of water. This method of dredging mixes the sediment with water to form a slurry. The disposal of this mixture represents the maximum possible suspension of material. The bucket dredging technique to be used for this project will maintain the disposed sediments in a cohesive mass, greatly reducing turbidity potentials.

The Disposal Site has been used for dredged material and various waste disposal for a number of years. The process of disposing sediments at this site buries the organisms inhabiting the site. This burial process has been of sufficient frequency at the Foul Area Disposal Site to maintain a disturbed environment at the point of disposal. A specialized population of benthic species have successfully exploited this disturbed niche and rapidly provide biomass and bioturbation to the newly disposed material. These pioneering organisms are already established on the disposal site (DAMOS, 1985) and their action will quickly rework the newly deposited sediments to ambient conditions. This process will not alter the chemical environment of the substrate since previous significant disposal operations have been required to analyze these sediments to fulfill the same criteria as this dredging project. The low concentrations of contaminants from the Library Site will not adversely affect the present chemical environment of the disposal site. As stated earlier (E. Affected Environment) the material to be dredged is generally Category I (MDWPC, 1978) except for PCB (Category II). In general, the Foul Area Disposal Site contains Category I, II and III sediments. Disposal of the project sediments should not adversely affect the FADS chemical environment.

Physically parameters such as currents, waves, and tidal circulations have been closely monitored for the site (DAMOS, 1985). This area has contained dredged material on site and does not disperse sediment or chemicals to affect ambient environments.

c. Biological Effects

The disposal of dredged sediments will bury those non-motile and larval/juvenile organisms at Foul Area Disposal Site that have inhabited the previously disposed material. The same pioneering species will quickly inhabit the newly disposed material by larval and adult recruitment. The overall process of maintaining a disturbed habitat will provide a productive benthic environment for organisms that will rework the substrate. This biological mixing of the substrates (bioturbation) will homogenize and oxygenate the upper few centimeters of the sediment. This will allow other organisms to begin inhabiting the substrate (colonization). Larvae will settle and metamorphize and adults will emigrate into the area, all contributing to restore benthic productivity.

To determine if the Dorchester Bay material will have a detrimental impact on the benthic biota of the disposal site due to chemical constituents of the sediment, bioassay and bioaccumulation studies were performed using substrate from Stations H, I, and J. The results of this testing are included in Appendix III of this report. All analysis procedures were in accordance with the guidelines established by the Environmental Protection Agency and the U.S. Army Corps of Engineers (1977).

The bioassay and bioaccumulation tests provide an indication of the chemical effects of the substrate on organisms that come in contact with it. The bioassay procedure exposes healthy indicator organisms to an actual sample of the substrate and monitors the mortality of the organisms. The survival rates are calculated for the dredge material and a suitable reference site. The statistical analysis of the results provide an indication of the sediment toxicity to the biota. The bioaccumulation tests define the amount of chemicals that have been bioconcentrated in the body tissue of the organism from contact with the substrate along with chemicals ingested through feeding activities. These accumulations are reflected in the body tissue concentrations of the surviving test organisms. The organisms analyzed were the crustacean, *Palaeomonetes pugio*, the hard clam, *Mercenaria mercenaria*, and the sand worm, *Nereis virens* (See Appendix A-III).

The bioassay results exhibited a survival range from 90.0% to 100% of the separate and combined species in the control aquaria. This indicates that laboratory procedures and equipment, as well as organism health, were of sufficient quality to allow for comparison of the test and reference results.

The solid phase results for separate and combined species reveal the survival of test species were not significantly less than the survival of organisms exposed for the same period of time to reference sediment.

The tissue of the organisms surviving the 10-day bioassay test was analyzed for uptake of cadmium, mercury, polychlorinated biphenyls, DDT and aromatic petroleum hydrocarbons. No statistically significant uptake of contaminants was exhibited.

The evaluation of the bioassay test results indicates this material is suitable for ocean disposal.

3) Threatened and Endangered Species

There are no Federally listed threatened or endangered species known to inhabit the dredging or disposal site. Cetaceans are transients of the disposal area and are not assumed to be impacted by ocean disposal. If any transient endangered species entered either area during the project operation, they would avoid the dredging or disposal activity. Since all impacts on the environment are temporarily and spatially limited, impacts on the food sources of these species are also assumed minimal.

4) Ecologically Significant Species

The dredging, pier and dolphin construction at the John F. Kennedy Library will not alter or remove any significant species. No populations of commercially important species were recovered at the Library Site during the 1985-1986 benthic sampling, except for the blue mussel, Mytilus edulis. The mussel beds at the proposed site will be minimally impacted during construction. These beds are close nearshore (see Affected Environment) at the intertidal tow of the riprap bank below the balustrade. Turbidity associated with the dredging operation has the potential to interfere with the feeding, spawning, and larval settlement of some species, possibly shellfish. To avoid these impacts, the dredging operation will occur in fall/winter seasons, the expected time of least larval recruitment.

The disposal area is not expected to contain ecologically significant species. The site has a history of use and is colonized by pioneering organisms (DAMOS, 1985) that are tolerant of frequent perturbation. Cetaceans are transients of the disposal area, but are not expected to be impacted by ocean disposal.

5) Historic and Archaeological Resources

The proposed construction of the JFK Library Dock will have "no adverse effect" on the historic character and setting of the Calf Island Pump Station, provided that the navigational dolphins are constructed of wood and timber. The Massachusetts Historical Commission feels that the use of concrete dolphins would "introduce visual elements which are uncharacteristic of, and may adversely affect the waterfront setting of the pump station" (see attached correspondence, 18 July 1986).

6. Social and Economic Resources

As stated in the Affected Environment section of this report, the pier construction and dredging of an access channel will link the J.F. Kennedy Library, the University of Massachusetts, the State Archives Building and the recreational balustrade of Columbia Point to other Boston Harbor resources via the water bus. Additionally, Columbia Point will be linked to Boston Harbor Islands. The area is currently serviced by mass transit routes (bus) and each facility maintains their own parking area. A two-lane, one way, perimeter road circulates traffic parallel to the balustrade.

The project will provide additional pedestrian traffic to Columbia Point via the ferry. Restroom facilities are currently available to the public in the John F. Kennedy Library. The increased use of the area for fishing and passive recreation, as well as attending the J.F.K. Library, may evolve into a volume large enough to require additional public facilities. There currently exists an abundance of developable space to provide public support facilities, especially in the area of the Pump House (see Figure A1). This abandoned building itself has the potential to provide a unique facility. Additionally, the increased tourism and recreation may require some public food service facilities. These projections are not expected to be excessive.

G. Mitigation

The adverse impacts associated with dredging include loss of flora and fauna from the channel, impacts associated with increased turbidity and burial from disposal. To mitigate these impacts the dredging and disposal operation will occur in a September through February time frame. Completing the work during this time frame avoids the spawning of winter flounder, shellfish and other organisms that might be impacted by dredging and disposal activities. Pier construction will use proper construction practices to prohibit intertidal impacts. Proper dredging techniques including disposal site management, will minimize adverse impacts. Disposal scows are required to be sound (not leak out materials) and an onboard NED inspector assures proper disposal.

H. Coordination

A public notice will be issued before dredging and construction. The proposed project will be coordinated with the following Federal and State agencies:

Federal Agencies

Environmental Protection Agency
National Marine Fisheries Service
U.S. Fish and Wildlife Service

Commonwealth of Massachusetts

Department of Environmental Management
Department of Enviornmental Quality Engineering
Office of Coastal Zone Management
State Historic Preservation Officer

I. Compliance

The compliance status of this project with Environmental Protection Statutes and Executive Orders is as follows:

STATUTES

1. Archaeological and Historic Preservation Act, as amended, 16 U.S.C. 469 et seq.

STATUS: It has been determined that the project area does not contain any archaeological, cultural or historic resources that would be impacted.

2. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

STATUS: Submission and review of this report to the Regional Administrator of the Environmental Protection Agency constitutes compliance with this Act. This document will be submitted.

3. Clean Water Act (Federal Water Pollution Control Act), as amended, 33 U.S.C. 1251 et seq.

STATUS: Dredging and the placement of pilings does not require review under this act. Disposal will be Ocean Disposal at the Foul Area Disposal Site (see Figure A4).

4. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq.

STATUS: This project will be reviewed under the applicable State Coastal Zone Management Program as a result of the Coastal Zone Management Act of 1972.

5. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

STATUS: Coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on the proposed project will occur.

6. Estuary Protection Act, 16 U.S.C. 1221 et seq.

STATUS: Submission of the assessment to the Department of the Interior constitutes compliance with this act.

7. Federal Water Project Recreation Act, as amended, 16 U.S.C. 661 et seq.

STATUS: Submission of this assessment to the Department of the Interior constitutes compliance with this act.

8. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 _et seq_.

STATUS: Coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service constitutes compliance with this act.

9. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 470-4 _et seq_.

STATUS: Submission of the assessment to the Department of the Interior constitutes compliance with this act.

10. Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 _et seq_.

STATUS: This project was evaluated by the assessment to be consistent with the Ocean Dumping criteria in Section 103 of this act.

11. National Historic Preservation Act of 1966, as amended 16 U.S.C. 470 _et seq_.

STATUS: Coordination with the Massachusetts State Historic Preservation Officer constituted compliance with this act. There were no archaeological, cultural or historic resources identified as being impacted by this project.

12. National Environmental Policy act of 1969, as amended, 42 U.S.C. 432 _et seq_.

STATUS: Preparation of this Environmental Assessment constitutes compliance with this act.

13. Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 _et seq_.

STATUS: This project does not adversly impact or contribute to flooding of any watershed.

14. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 _et seq_.

STATUS: This project does not involve any wild or scenic river.

Executive Orders

1. Executive Order 11988, Floodplain Management, 24 May 1977.

STATUS: In accordance with this Executive Order the proposed project would not contribute to negative impacts or damages caused by floods.

2. Executive Order 11990, Protection of Wetlands, 24 May 1977.

STATUS: This Executive Order is not applicable. There will be no impacts on wetlands by this project.

3. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

STATUS: This executive Order is not applicable to this project.

J. References

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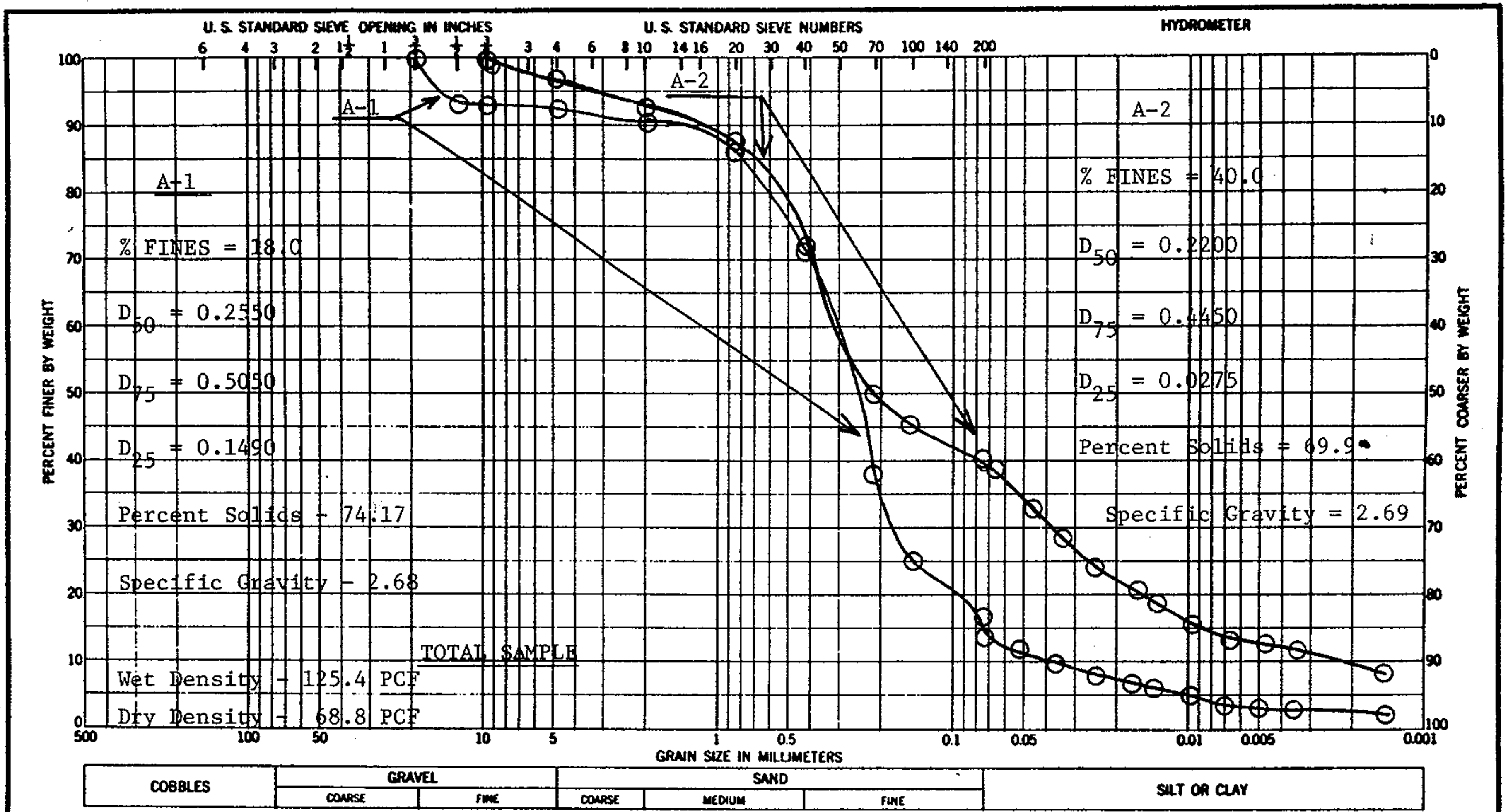
SECTION A

APPENDIX I

PHYSICAL AND CHEMICAL
ANALYSES OF SEDIMENTS



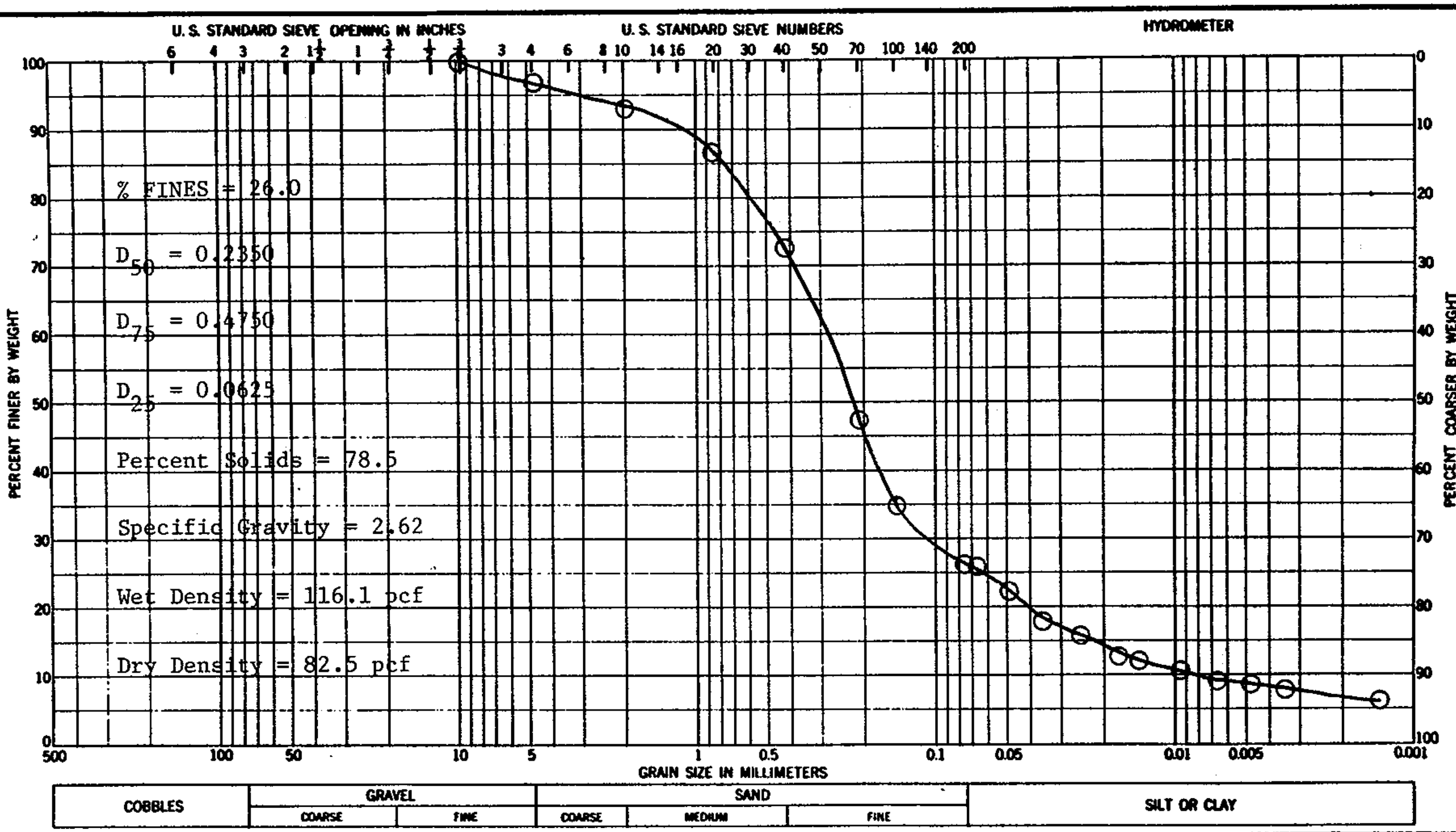
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
A-1	0.0' - 0.33'	Dark gray clayey SAND(SC) with trace shell fragments	32.3	non-plastic		
A-2	0.33' - 1.17'	Olive gray clayey SAND(SC)	49.5	52	26	26

GRADATION CURVES

Project JOHN F. KENNEDY LIBRARY
PIER PROJECT
Area COLUMBIA POINT, DORCHESTER, MA
Boring No. SITE A
Date JANUARY 1986

ENG FORM 1 MAY 63 2087

GPO 926-280



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
B	0.0'-1.83'	Olive gray clayey SAND (SC) with trace of shell fragments	40.7	43	23	20

GRADATION CURVES

Project JOHN F. KENNEDY LIBRARY PIER PROJECT

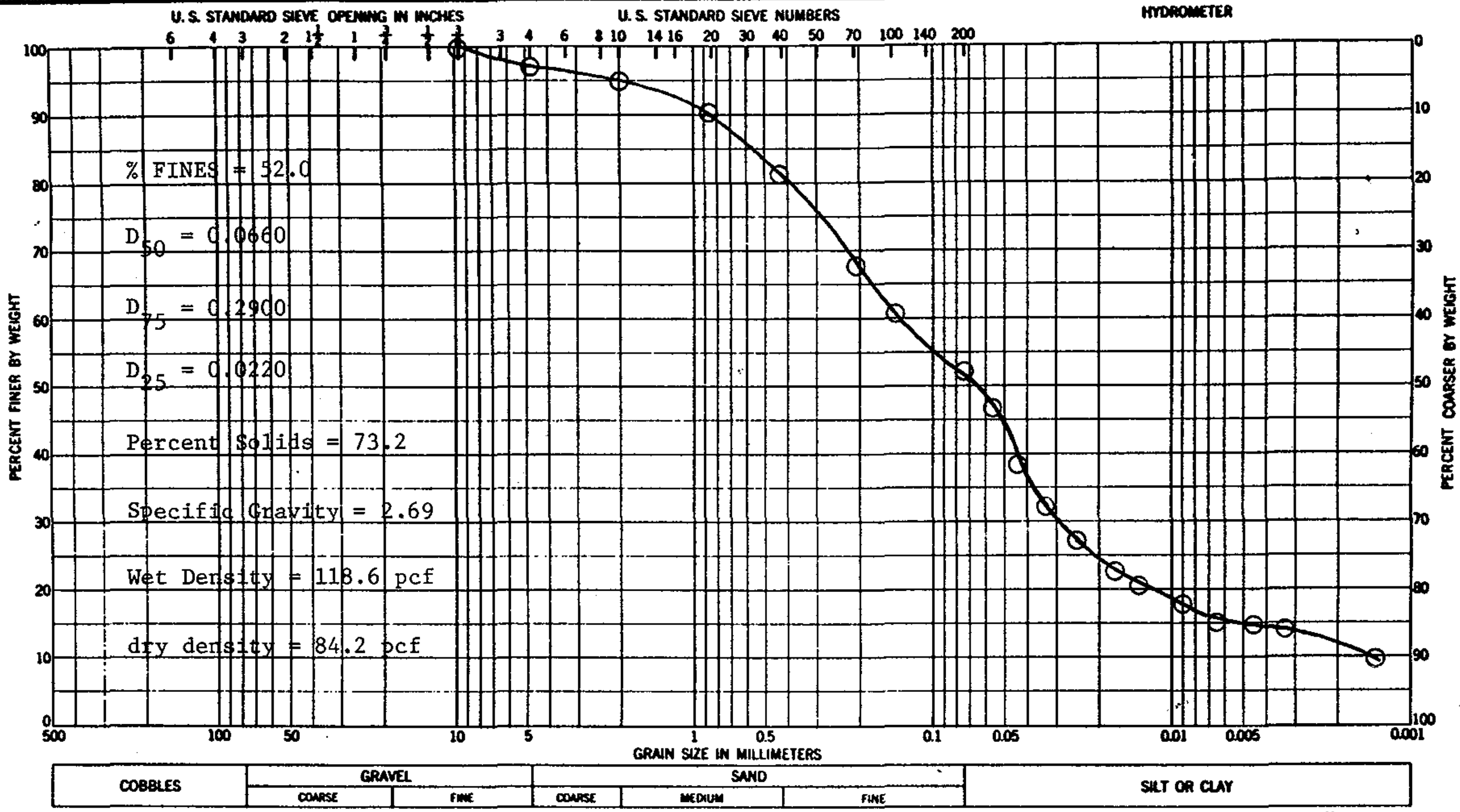
Area COLUMBIA POINT, DORCHESTER, MA

Boring No. SITE B

Date JANUARY 1985

ENG FORM 1 MAY 63 2087

GPO 926-250

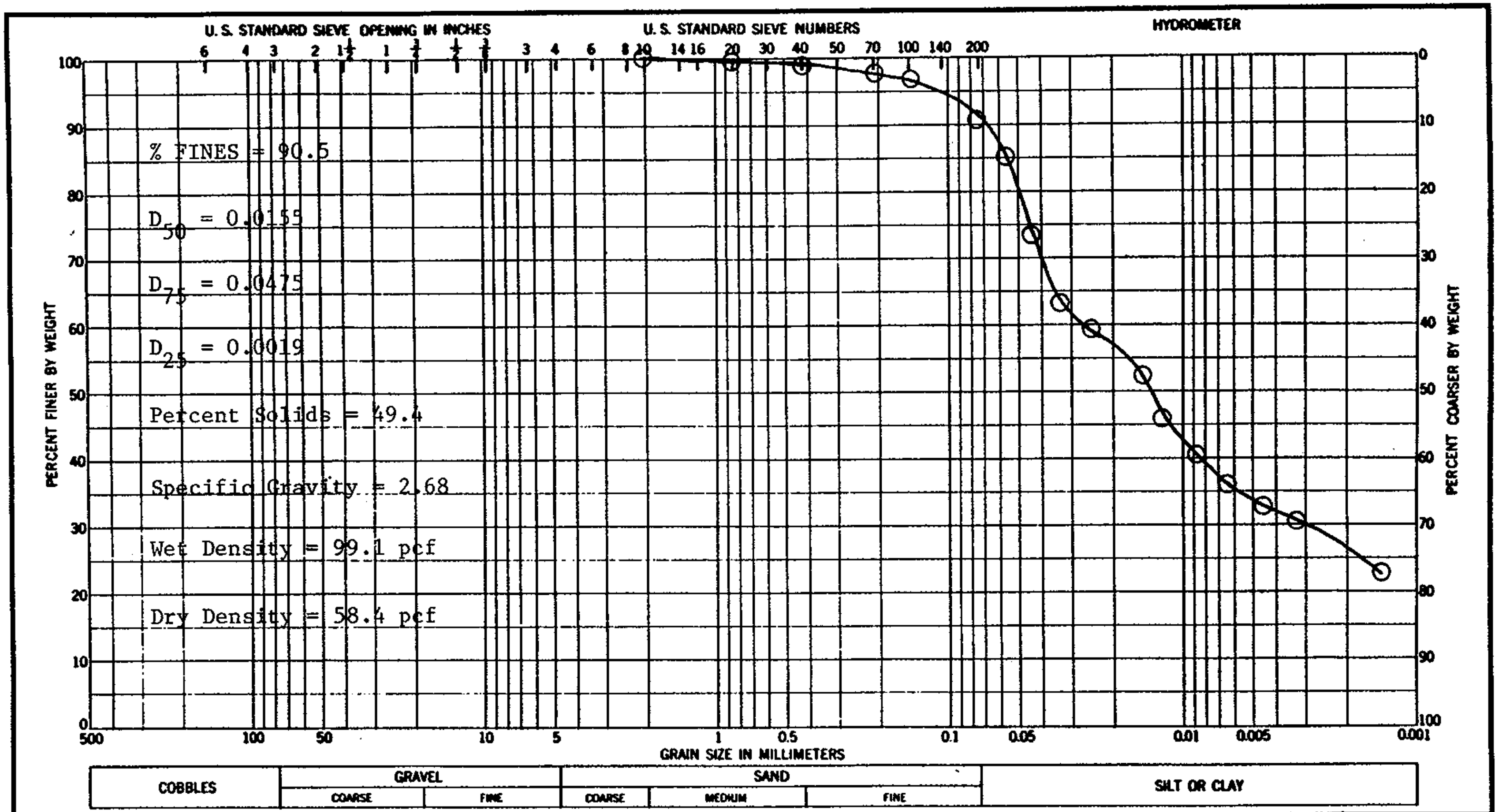


A-I-3

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
C	0.0'-1.13'	Olive gray sandy organic clay (OL)	40.9	41	24	17

Project	JOHN F. KENNEDY LIBRARY PIER PROJECT
Area	COLUMBIA POINT, DORCHESTER, MA
Boring No.	SITE C
Date	JANUARY 1985

GRADATION CURVES



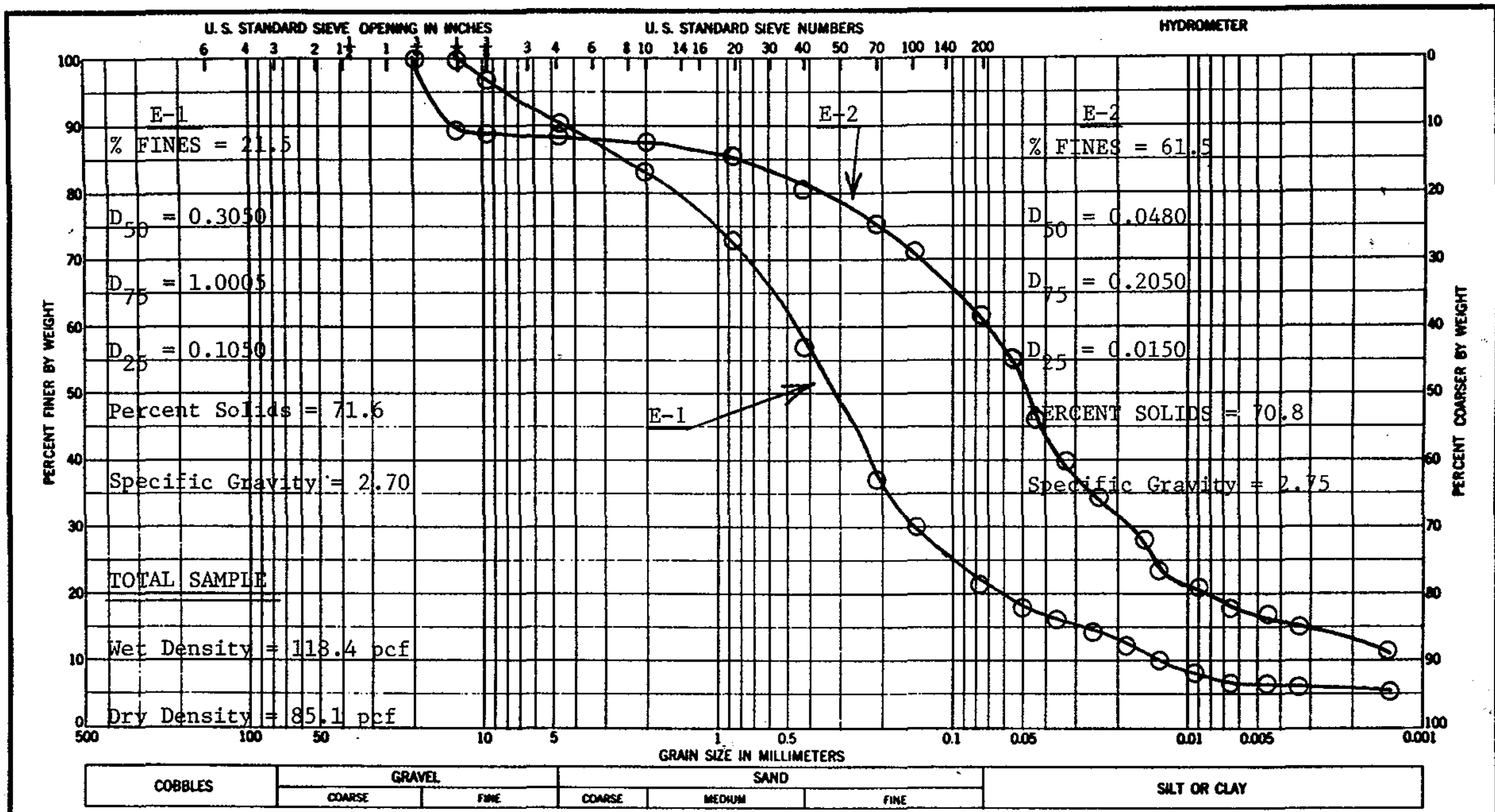
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
D	0.0'-2.75'	Dark gray organic CLAY(OH)	69.6	71	32	39

GRADATION CURVES

Project JOHN F. KENNEDY LIBRARY
PIER PROJECT
Area COLUMBIA POINT, DORCHESTER, MA
Boring No. JANUARY 1985
Date SITE D

ENG FORM 1 MAY 63 2087

GPO 926-280



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
E-1	0.0'-0.21'	Dark gray clayey SAND(SC) with trace shell fragments.	28.8	non-plastic		
E-2	0.21'-1.0'	Olive gray sandy organic CLAY(OL) with shell fragments.	42.0	40	22	18

GRADATION CURVES

Project JOHN F. KENNEDY LIBRARY PIER PROJECT

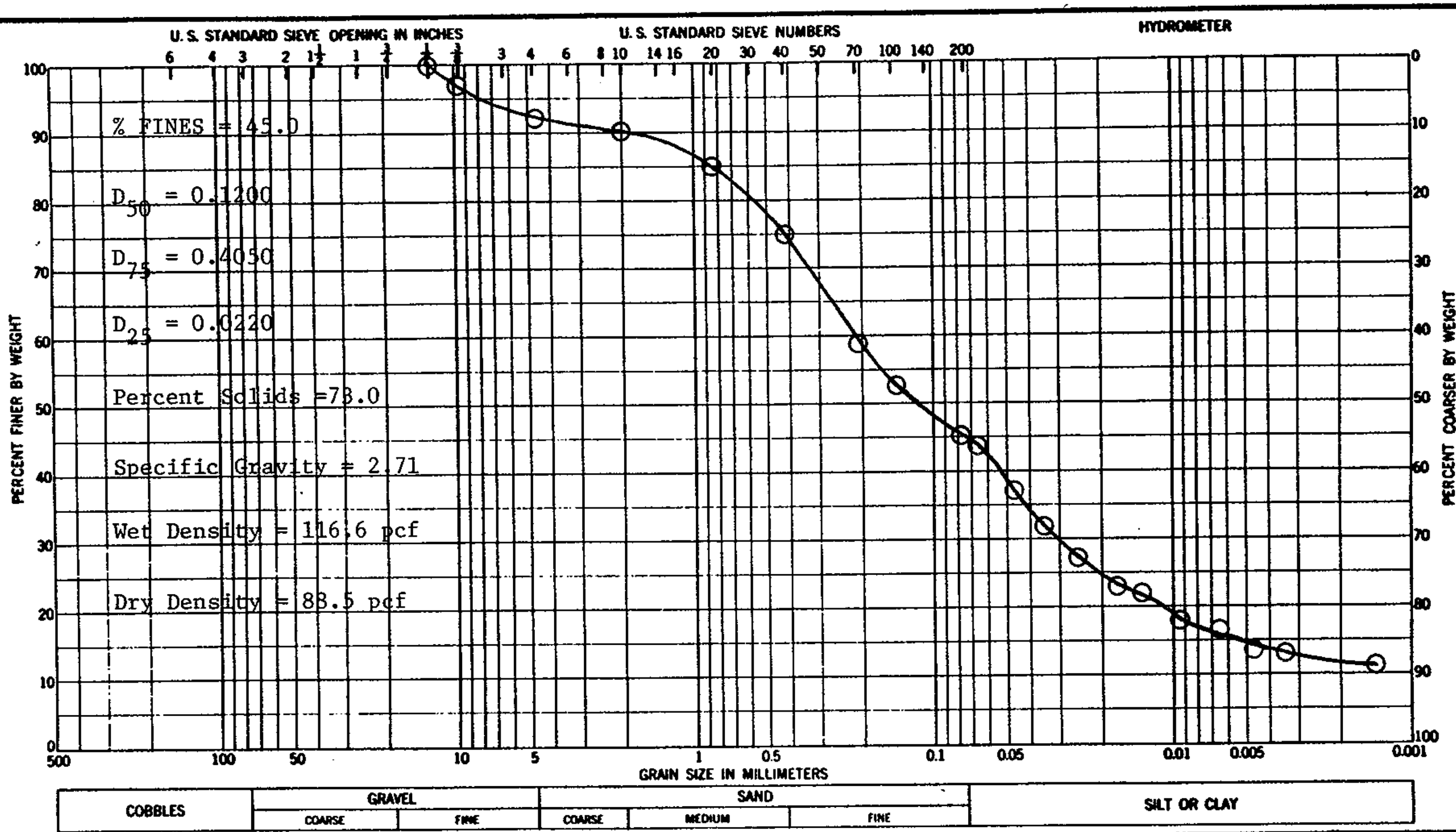
Area COLUMBIA POINT, DORCHESTER, MA

Boring No. SITE E

Date JANUARY 1985

ENG FORM 1 MAY 63 2087

GPO 926-250



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
F	0.0'-1.17'	Olive gray clayey SAND(SC) with trace of shell fragments	31.7	44	22	22

Project JOHN F. KENNEDY LIBRARY PIER PROJECT

Area COLUMBIA POINT, DORCHESTER, MA

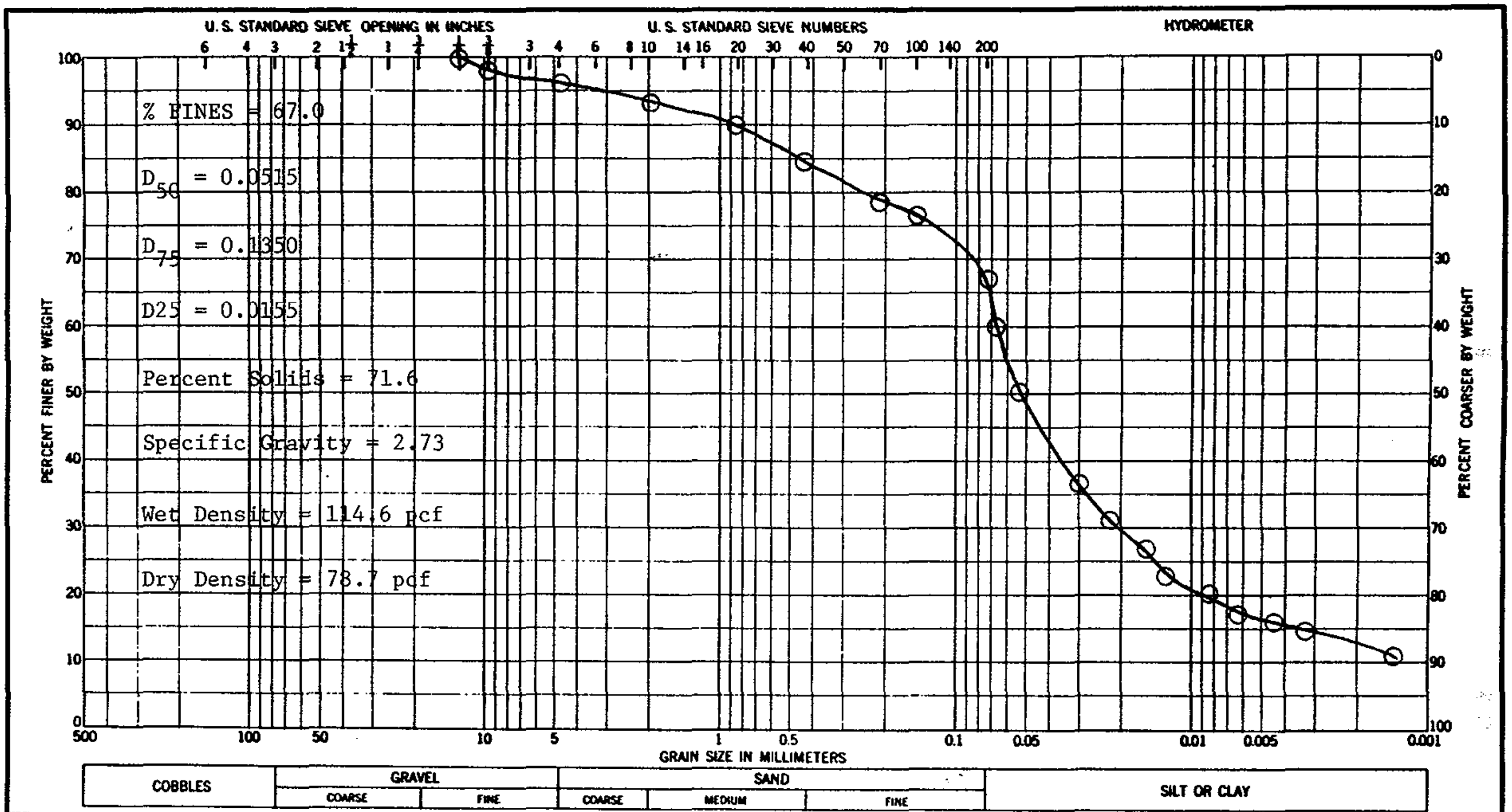
Boring No. SITE F

Date JANUARY 1985

GRADATION CURVES

ENG FORM 1 MAY 63 2087

GPO 926-280



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
G	0.0'-1.25'	Olive gray sandy organic CLAY(OL) with trace of shell fragments.	45.6	42	23	18

Project JOHN F. KENNEDY LIBRARY
PIER PROJECT

Area COLUMBIA POINT, DORCHESTER, MA

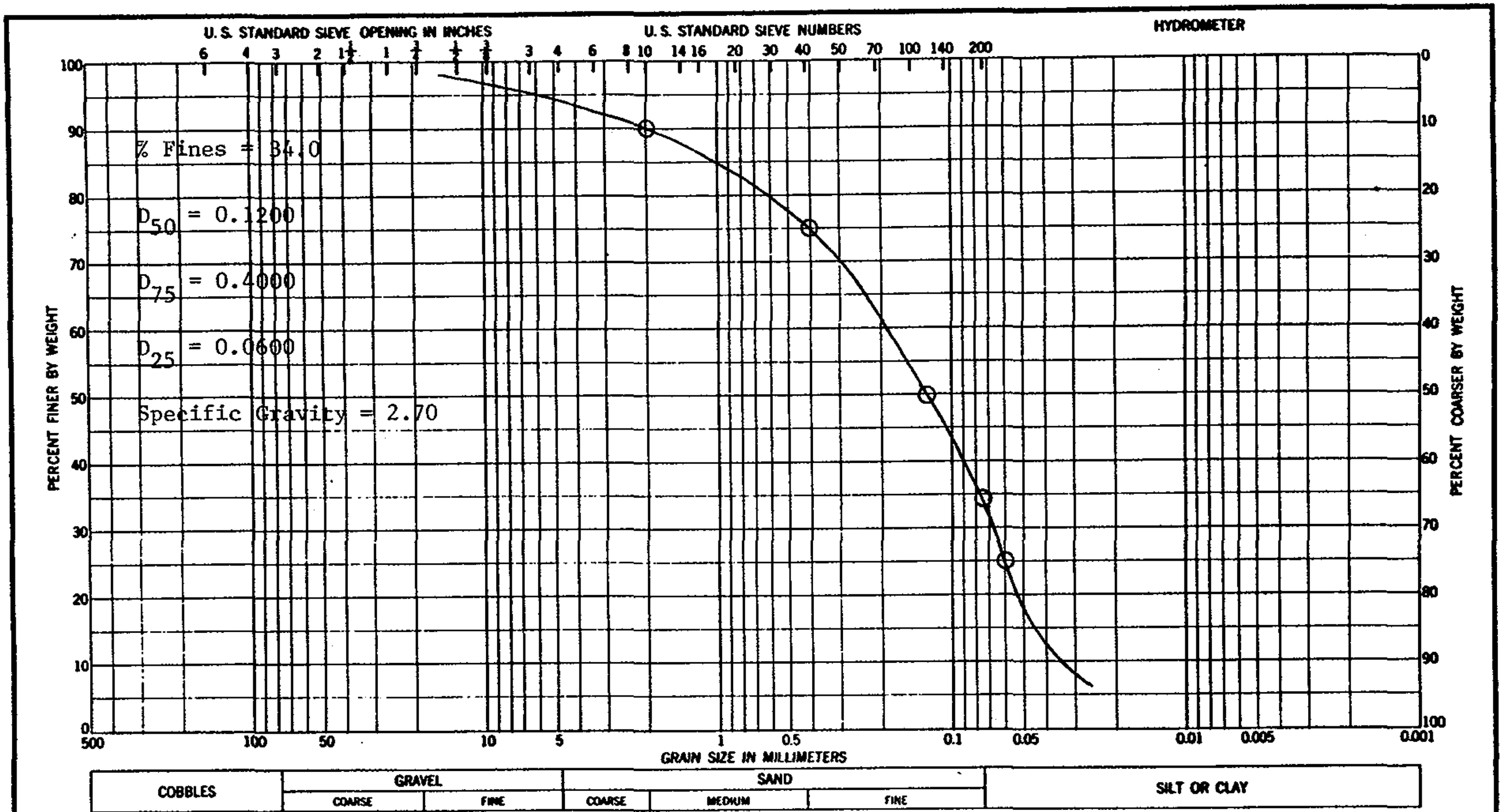
Boring No. SITE G

Date JANUARY 1985

GRADATION CURVES

ENG FORM 1 MAY 63 2087

GPO 926-250



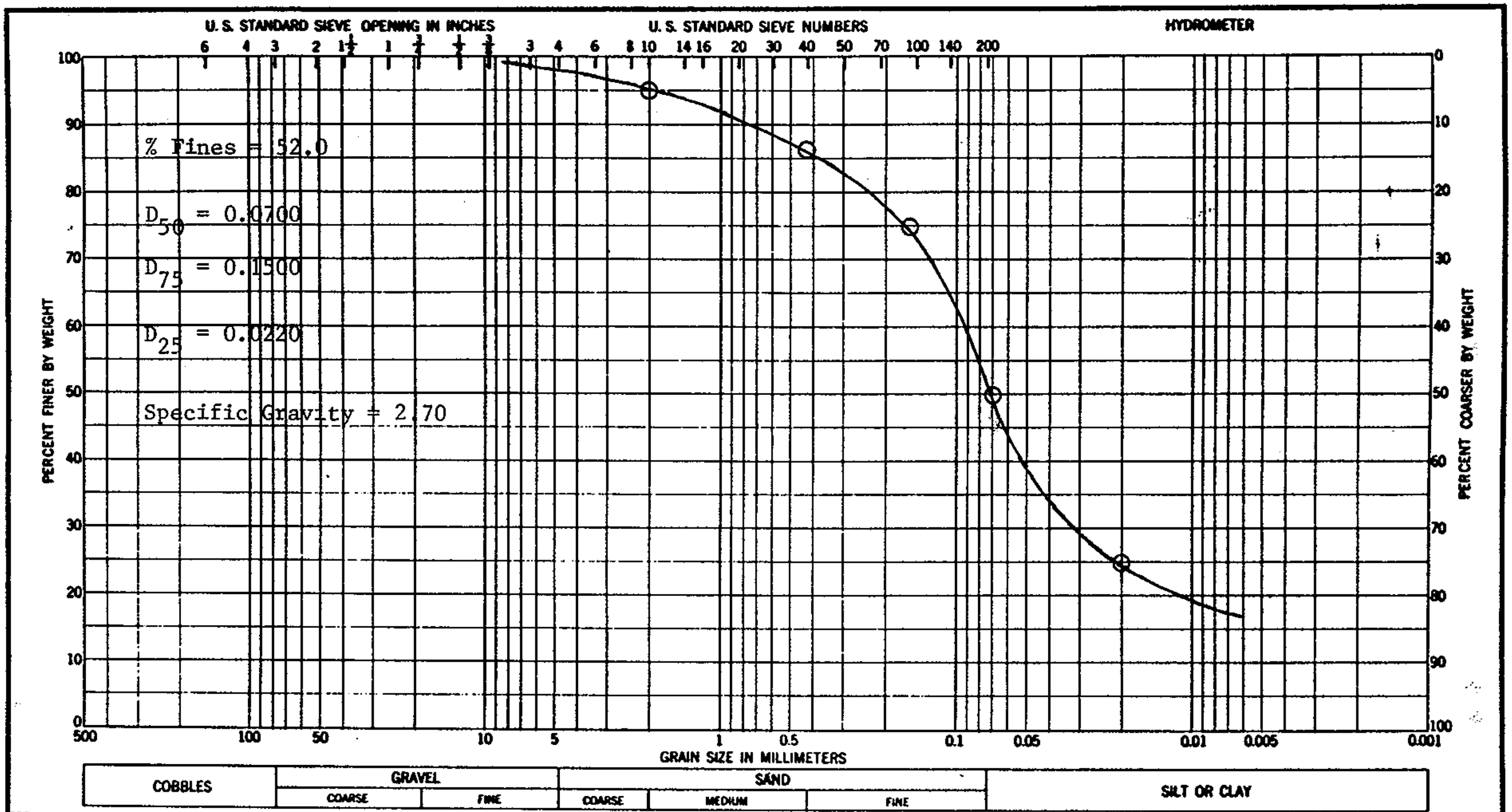
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
H	Surface	Gray Clayey SAND (SC)				

GRADATION CURVES

Project	JOHN F. KENNEDY LIBRARY PIER PROJECT
Area	COLUMBIA POINT, DORCHESTER, MA
Boring No.	SITE H (Bioassay)
Date	AUGUST 1986

ENG FORM 1 MAY 63 2087

GPO 926-280



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
I	Surface	Gray Sandy Fat CLAY (CH)				

GRADATION CURVES

Project JOHN F. KENNEDY LIBRARY PIER PROJECT

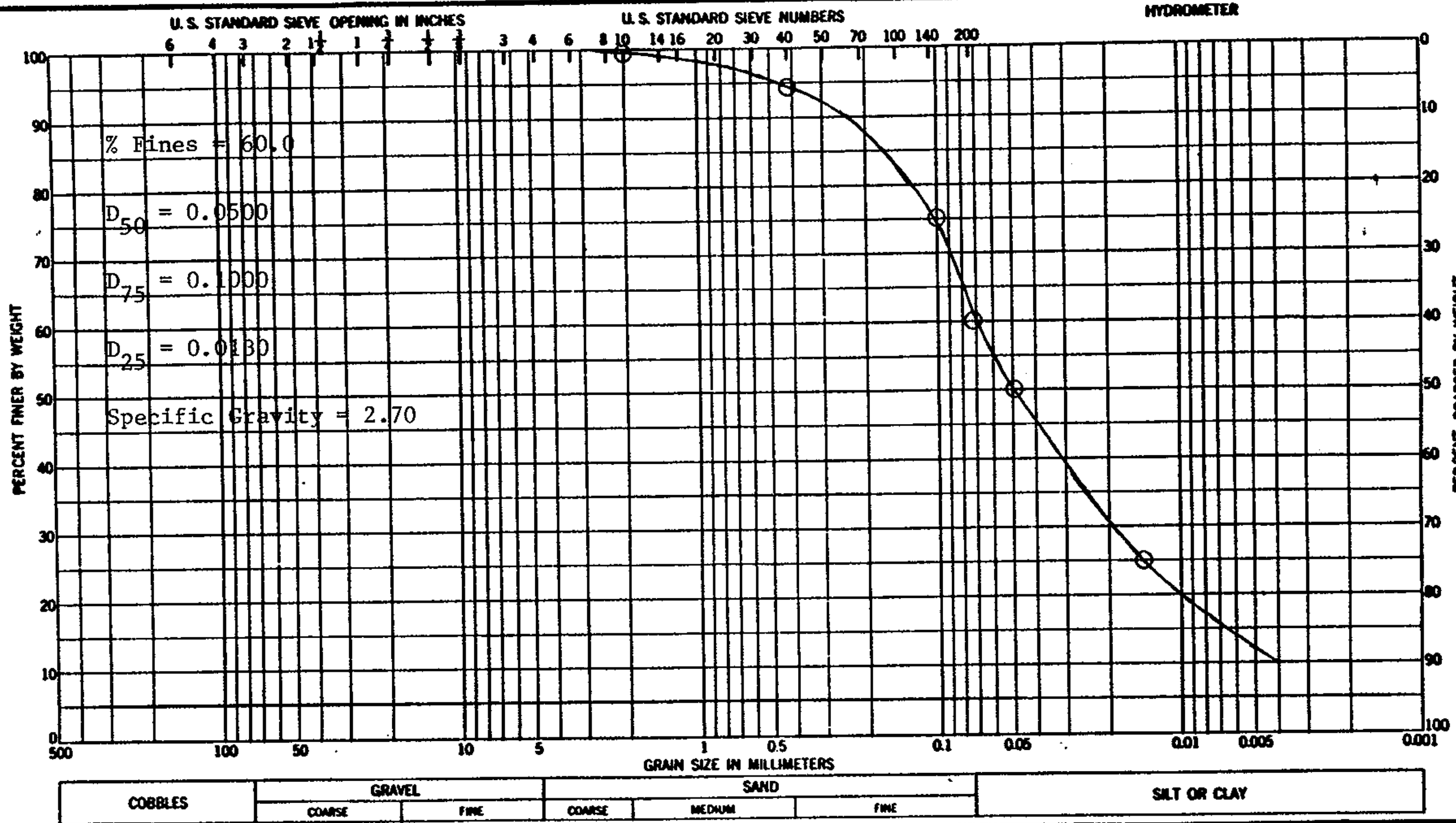
Area COLUMBIA POINT, DORCHESTER, MA

Boring No. SITE I (Bioassay)

Date AUGUST 1986

ENG FORM 1 MAY 63 2087

GPO 926-250



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
J	Surface	Gray Sandy Fat CLAY (CH)				

Project	JOHN F. KENNEDY LIBRARY
	PIER PROJECT
Area	COLUMBIA POINT, DORCHESTER, MA
Boring No.	SITE J (Bioassay)
Date	AUGUST 1986

GRADATION CURVES

ENG FORM 1 MAY 63 2087

GPO 926-250

J.F.K. LIBRARY PIER PROJECT
COLUMBIA POINT, DORCHESTER, MASSACHUSETTS

PHYSCIAL TEST RESULTS - MARINE SEDIMENT - ENVIRONMENTAL SAMPLES

PUMP HOUSE SITE

PARAMETER	SITE A	SITE A	SITE B	SITE C	SITE D
VISUAL CLASSIFICATION	DARK GREY CLAYEY SAND (SC) WITH TRACE OF SHELL FRAGMENTS	OLIVE GRAY CLAYEY SAND (SC)	OLIVE GRAY CLAYEY SAND (SC) WITH TRACE OF SHELL FRAGMENTS		DARK GRAY ORGANIC CLAY (OH)
DEPTH (Feet)	0.0 - 0.33	0.33 - 1.17	0.0 - 1.83	0.0 - 1.13	0.0 - 2.75
Grain Size - Median(mm)	0.2550	0.2200	0.2350	0.0660	0.0155
" " D_{75}	0.5050	0.4450	0.4750	0.2900	0.0475
" " D_{25}	0.1490	0.0275	0.0625	0.0220	0.0019
Sorting Coefficient	1.841	4.023	2.757	3.631	5.000
Normal(N) or Bimodal(B) Curve	N	N	N	B	B
Specific Gravity	2.68	2.69	2.62	2.69	2.68
% Fines	18.0	40.0	26.0	52.0	90.5
Percent Solids	74.17	69.9	78.5	73.2	49.4
Liquid Limit	non-plastic	52	43	41	71
Plastic Limit		26	23	24	32
Plastic Index		26	20	17	39
Wet Unit Weight (PCF)	125.4		116.1	118.6	99.1
Dry Unit Weight (PCF)	86.8		82.5	84.2	58.4
% Volatile Solids-EPA	2.62	2.29	6.89	3.01	5.66
% Volatile Solids-NED	1.15	1.36	1.84	1.65	3.78
Natural Moisture Content (% Dry Weight)	32.3	49.5	40.7	40.9	69.9

J.F.K. LIBRARY PIER PROJECT
COLUMBIA POINT, DORCHESTER, MASSACHUSETTS

PHYSCIAL TEST RESULTS - MARINE SEDIMENT - ENVIRONMENTAL SAMPLES

LIBRARY SITE

PARAMETER	SITE E	SITE E	SITE F	SITE G
VISUAL CLASSIFICATION	DARK GRAY CLAYEY SAND (SC) WITH TRACE OF SHELL FRAGMENTS	OLIVE GRAY SANDY ORGANIC CLAY(OL) WITH TRACE OF SHELL FRAGMENTS	OLIVE GRAY CLAYEY SAND (SC) WITH TRACE OF SHELL FRAGMENTS	OLIVE GRAY SANDY ORGANIC CLAY(OL) WITH TRACE OF SHELL FRAGMENTS
DEPTH (Feet)	0.0 - 0.21	0.21 - 1.0	0.0 - 0.17	0.0 - 1.25
Grain Size - Median (mm)	0.3050	0.0480	0.1200	0.0515
" " D_{75}	1.0005	0.2050	0.4050	0.1350
" " D_{25}	0.1050	0.0150	0.0220	0.0155
Sorting Coefficient	3.087	3.697	4.291	2.951
Normal (N) or Bimodal (B) Curve	N	N	N	N
Specific Gravity	2.70	2.75	2.71	2.73
% Fines	21.5	61.5	45.0	67.0
Percent Solids	71.6	70.8	73.0	71.6
Liquid Limit	non-plastic	40	44	42
Plastic Limit		22	22	23
Plastic Index		18	22	18
Wet Unit Weight (PCF)	118.4		116.6	114.6
Dry Unit Weight (PCF)	85.1		88.5	78.7
% Volatile Solids - EPA	1.78	2.55	1.81	2.27
% Volatile Solids - NED	0.91	1.46	0.89	1.17
Natural Moisture Content (% Dry Weight)	28.8	42.0	31.7	45.6

J.F.K. LIBRARY PIER PROJECT
BULK SEDIMENT - CHEMICAL ANALYSIS - MARINE SEDIMENTS
PUMP HOUSE (SOUTH) SITE

SAMPLE SITE	SITE A		SITE B		SITE C		SITE D	
Depth (Ft)	0.0-0.33	1.2-1.45	0.0-0.25	1.75-2.0	0.0-0.25	0.95-1.2	0.0-0.25	3.05-3.3
Soil Description	Dark Gray Clayey Sand(SC)	Olive Gray Clayey Sand(SC)	Olive Gray Clayey Sand(SC)		Olive Gray Sandy Organic Clay(OL)		Dark Gray Organic Clay(OH)	
Median Grain Size	0.2500	0.2000	0.2200		0.0650		0.0155	
% Fines	18	40	26		52		90.5	
Specific Gravity	2.68	2.69	2.62		2.69		2.68	
% Solids	74.17	69.9	79.8	77.2	71.2	75.2	45.0	53.8
% Volatile Solids EPA	2.62	2.29	6.51	7.27	4.06	1.95	5.10	6.22
% Volatile Solids NED	1.15	1.36	1.26	2.42	1.98	1.32	3.52	4.03
Chemical Oxygen Demand (ppm)	30,500	14,800	22,100	15,400	28,600	24,600	46,700	86,100
Oil & Grease (PHCs)(ppm)	38.3	104	660	1,490	345	64	848	832
Mercury(ppm)	3.2	<0.1	2.3	6.0	3.9	<0.1	0.3	0.7
Lead (ppm)	685	15	1,180	2,980	137	<16	99	191
Zinc (ppm)	376	48	321	646	92	33	134	236
Arsenic (ppm)	1.0	<1.0	1.0	1.0	2.0	3.3	5.9	7.6
Barium (ppm)	330	<140	400	800	<140	140	180	360
Cadmium (ppm)	4	<3	<3	<3	<3	<3	<3	<3
Chromium (ppm)	50	15	48	70	24	14	93	188
Copper (ppm)	523	11	785	640	97	7	83	117
Nickel (ppm)	34	23	24	69	23	<24	26	33
Vanadium (pp)	<122	<122	<122	<122	<122	<122	<122	130
% Carbon	0.57		1.05		1.76		2.20	
% Hydrogen	0.14		0.17		0.19		0.43	
% Nitrogen	0.10		0.10		0.10		0.26	
DDT - (ppb)	<0.01		<0.01		<0.01		<0.01	
PCB - (ppb)	790		5,630		1,650		140	

J.F.K. LIBRARY PIER PROJECT
BULK SEDIMENT - CHEMICAL ANALYSIS - MARINE SEDIMENTS
LIBRARY (NORTH) SITE

SAMPLE SITE	SITE E		SITE F		SITE G	
Depth (Ft)	0.0-0.25	0.95-1.1	0.0-0.25	1.95-1.2	0.0-0.25	1.25-1.5
Soil Description	Dark Gray Clayey Sand(SC)	Olive Gray Sandy Organic Clay (OL)	Olive Gray Clayey Sand(SC)		Olive Gray Sandy Organic Clay(OL)	
Median Grain Size	0.3000	0.0500	0.1200		0.550	
% Fines	21	62	45		68	
Specific Gravity	2.70	2.75	2.71		2.73	
% Solids	71.6	70.8	76.8	69.2	73.2	69.9
% Volatile Solids EPA	1.78	2.55	1.17	2.44	1.87	2.67
% Volatile Solids NED	0.91	1.46	0.54	1.24	0.92	1.41
Chemical Oxygen Demand (ppm)	13,900	14,100	6,550	24,500	18,600	25,500
Oil & Grease (PHCs)(ppm)	382	238	126	54	154	1.46
Mercury (ppm)	0.2	<0.1	<0.1	0.1	<0.1	<0.1
Lead (ppm)	63	53	49	49	81	40
Zinc (ppm)	57	54	38	54	64	42
Arsenic (ppm)	2.8	5.5	1.9	1.9	1.5	2.0
Barium (ppm)	<140	<140	<140	<140	<140	<140
Cadmium (ppm)	<3	<3	<3	<3	<3	<3
Chromium (ppm)	21	21	12	17	23	16
Copper (ppm)	21	23	12	13	24	10
Nickel (ppm)	<24	<24	<23	<24	<24	<23
Vanadium (pp)	<122	<122	<122	<122	<122	<122
% Carbon	0.60		2.60		0.54	
% Hydrogen	0.18		0.14		0.15	
% Nitrogen	0.10		0.10		0.10	
DDT - (ppb)	<0.01		<0.01		<0.01	
PCB - (ppb)	930		30		160	

JOHN F. KENNEDY LIBRARY PIER

SEDIMENT TEST RESULTS

LIBRARY SITE - BIOASSAY SAMPLES

PARAMETER	SITE H	SITE I	SITE J
Depth	Surface	Surface	Surface
Visual Classification	Gray Clayey SAND (SC)	Gray Sandy Fat CLAY (CH)	Gray Sandy Fat CLAY (CH)
Median Grain Size	0.1200	0.0700	0.0500
D_{75}	0.4000	0.1500	0.1000
D_{25}	0.0600	0.0220	0.0130
Normal (N) or Bimodal (B) Curve	N	N	N
Specific Gravity	2.70	2.70	2.70
% Fines	34.0	52.0	60.0
PCBs (ppb)	$<$ 100	$<$ 100	$<$ 100
DDT (ppb)	$<$ 50	$<$ 50	$<$ 50

August 1986 Bioassay Samples

ELUTRIATE TESTING

JFK Library, January, 1986

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from the center of proposed dredging site and (2) water from center of proposed dredging site.

	Dredge Site Water Average of 3	Standard Elutriate Designation and Sediment Depth Used in Preparation Location "A" 0.0-1.2 ft			Dredge Site Water Average of 3	Standard Elutriate Designation and Sediment Depth Used in Preparation Location "B" 0.0-1.1 ft		
		R1	R2	R3		R1	R2	R3
Nitrate/Nitrite Nitrogen(N), ppm	0.28	0.10	0.11	0.07	0.28	0.07	0.06	0.06
Sulfate (SO_4), ppm	3,200	2,600	2,500	2,600	3,200	2,600	2,700	2,700
Oil and Grease, ppm	<1	<1	<1	<1	<1	<1	<1	<1
Phosphorus								
ortho, ppm	0.05	0.06	0.09	0.06	0.05	<0.01	0.01	0.02
total, ppm	0.08	0.13	0.13	0.09	0.08	<0.01	0.05	0.05
Mercury (Hg), ppb	<0.2	<0.1	0.47	<0.1	<0.2	<0.1	<0.1	<0.1
Lead (Pb), ppb	<5	<5	<5	<5	<5	<5	<5	<5
Zinc (Zn), ppb	<15	<15	<15	<15	<15	20	17	24
Arsenic (As), ppb	<1	5.7	6.1	8.7	<1	<1	<1	<1
Cadmium (Cd), ppb	<1	<1	1.1	5.8	<1	<1	1.7	1.2
Chromium (Cr), ppb	<1.5	<1.5	<1.5	9.7	<1.5	<1.5	<1.5	<1.5
Copper (Cu), ppb	<1	<1	<1	<1	<1	<1	<1	<1
Nickel (Ni), ppb	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Barium (Ba), ppb	60	85	88	<15	60	<15	300	56
Vanadium (V), ppb	<10	69	40	46	<10	<10	<10	<10
Total PCB, ppb	0.91	0.78	1.32	1.34	0.91	0.29	1.02	0.03
Total DDT, ppb	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

ELUTRIATE TESTING
JFK Library, January 1986

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from the center of proposed dredging site and (2) water from center of proposed dredging site

	Dredge Site Water Average of 3	Standard Elutriate Designation and Sediment Depth Used in Preparation Location "C" 0.0-1.05 ft			Dredge Site Water Average of 3	Standard Elutriate Designation and Sediment Depth Used in Preparation Location "D" 0.0-1.6 ft		
		R1	R2	R3		R1	R2	R3
Nitrate/Nitrite Nitrogen(N), ppm	0.28	0.05	0.05	0.06	0.28	<0.05	<0.05	<0.05
Sulfate (SO_4), ppm	3,200	2,600	2,800	2,900	3,200	2,500	2,400	2,300
Oil and Grease, ppm	<1	<1	<1	<1	<1	<1	<1	<1
Phosphorus								
ortho, ppm	0.05	0.11	0.08	0.07	0.05	0.37	0.36	0.37
total, ppm	0.08	0.14	<0.01	0.12	0.08	0.01	0.51	0.02
Mercury (Hg), ppb	<0.2	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
Lead (Pb), ppb	<5	<5	<5	<5	<5	<5	<5	<5
Zinc (Zn), ppb	<15	17	33	<15	<15	<15	<15	<15
Arsenic (As), ppb	<1	5.8	4.2	4.8	<1	2.4	2.7	2.3
Cadmium (Cd), ppb	<1	1.1	<1	<1	<1	<1	1.5	<1
Chromium (Cr), ppb	<1.5	<1.5	3.5	<1.5	<1.5	1.8	1.7	<1.5
Copper (Cu), ppb	<1	<1	<1	<1	<1	<1	<1	3.1
Nickel (Ni), ppb	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	9.4
Barium (Ba), ppb	60	130	100	370	60	70	79	110
Vanadium (V), ppb	10	47	44	30	10	84	59	65
Total PCB, ppb	0.91	0.74	0.30	0.56	0.91	0.22	0.29	2.81
Total DDT, ppb	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

ELUTRIATE TESTING
JFK Library, January 1986

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from center of proposed dredging site and (2) water from the center of proposed dredging site

	Dredge Site Water Average of 3	Standard Elutriate Designation and Sediment Depth Used in Preparation Location "E" 0.0-0.85 ft			Dredge Site Water Average of 3	Standard Elutriate Designation and Sediment Depth Used in Preparation Location "F" 0.0-0.95 ft		
		R1	R2	R3		R1	R2	R3
Nitrate/Nitrite Nitrogen(N), ppm	0.28	0.05	0.25	0.26	0.28	0.30	0.28	0.27
Sulfate (SO_4), ppm	3,200	2,700	2,600	2,600	3,200	2,700	2,600	1,700
Oil and Grease, ppm	<1	<1	<1	<1	<1	<1	<1	<1
Phosphorus								
ortho, ppm	0.05	0.03	0.02	0.03	0.05	0.06	0.03	0.03
total, ppm	0.08	0.02	0.02	0.04	0.08	0.05	0.04	0.10
Mercury (Hg), ppb	<0.2	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
Lead (Pb), ppb	<5	<5	<5	<5	<5	<5	<5	<5
Zinc (Zn), ppb	<15	17	20	23	<15	<15	<15	<15
Arsenic (As), ppb	<1	1.3	1.0	2.3	<1	1.9	3.1	2.7
Cadmium (Cd), ppb	<1	<1	<1	<1	<1	<1	<1	<1
Chromium (Cr), ppb	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Copper (Cu), ppb	<1	<1	<1	<1	<1	1.7	<1	<1
Nickel (Ni), ppb	<2.5	<2.5	<2.5	<2.5	<2.5	3.1	<2.5	3.3
Barium (Ba), ppb	60	30	100	36	60	34	<15	<15
Vanadium (V), ppb	<10	31	24	30	<10	39	38	29
Total PCB, ppb	0.91	0.22	0.60	0.27	0.91	0.84	0.15	0.28
Total DDT, ppb	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

ELUTRIATE TESTING
JFK Library, January, 1986

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from proposed dredging site and (2) water from the center of proposed disposal site.

	Dredge Site Water Average of 3	Standard Elutriate Designation and Sediment Depth Used in Preparation Location "G" 0.0-1.25			Field Blank (Av of 3)	EPA Criteria (29 July 85)
		R1	R2	R3		
Nitrate/Nitrite Nitrogen(N), ppm	0.28	0.27	0.28	<0.05	-	10 b
Sulfate (SO_4), ppm	3,200	2,600	2,400	2,800	-	-
Oil and Grease, ppm	<1	<1	<1	<1	-	-
Phosphorus						
ortho, ppm	0.05	0.10	0.40	0.07	0	0.1 b
total, ppm	0.08	0.15	0.20	0.06	-	0.1 b
Mercury (Hg), ppb	<0.2	<0.1	<0.1	<0.1	-	2.1a
Lead (Pb), ppb	<5	<5	<5	<5	<5	140a
Zinc (Zn), ppb	<15	<15	<15	<15	<15	170b
Arsenic (As), ppb	<1	9.6	15	7.5	-	69a
Cadmium (Cd), ppb	<1	<1	<1	1.9	1	43a
Chromium (Cr), ppb	<1.5	<1.5	<1.5	<1.5	<1.5	1,110a
Copper (Cu), ppb	<1	1.6	1	<1	<1	2.9b
Nickel (Ni), ppb	<2.5	<2.5	<2.5	<2.5	4.2	140b
Barium (Ba), ppb	60	27	40	23	<15	-
Vanadium (V), ppb	<10	51	59	53	<10	
Total PCB, ppb	0.91	4.17	0.31	0.09	0.02	0.03b
Total DDT, ppb	<0.01	<0.01	<0.01	<0.01	<0.01	0.13b

a) one-hour concentration once every three years on average
b) *any one time*

Table IV-3-2a.(S.A.I.C., 1985).

Results of Chemical Analysis- Foul Area
North-South Transect Near 70°35' .00 - April 1983

Location	% Volatiles NED	ppm Oil & Grease	ppm Cr	ppm Zn	ppm Cu	ppm As
1000N-150W	1.51	757	55	233	35	14.5
500N-150W	4.20	2,740	208	327	133	7.6
100N-350W	4.00	1,780	225	260	100	6.5
400W	2.22	6,510	444	469	114	10.2
275W	3.36	1,830	225	266	100	5.4
150W	4.39	2,790	215	285	100	5.8
50W	2.99	1,840	176	168	81	5.2
CTR	1.65	158	38	92	17	50
250S-400W	4.10	4,210	241	424	147	14.0
250S-150W	3.28	2,550	216	301	106	6.0
500S-150W	2.69	3,670	188	525	106	25.6
1000S-150W	4.09	610	81	292	46	11.1
$\bar{X}$	3.21	2453.75	192.67	303.50	90.42	13.49
σ - \	1.01	1757.83	106.39	121.87	39.14	12.90

SAIC

Table IV-3-2b.(S.A.I.C., 1985).

Results of Chemical Analysis- Foul Area
North-South Transect Near 70°34' .00 - April 1983

Location	% Volatiles NED	ppm Oil & Grease	ppm Cr	ppm Zn	ppm Cu	ppm As
1000N-850E	1.71	681	37	179	39	9.0
500N-850E	3.64	761	76	175	43	9.3
850E	4.22	1,210	90	196	43	10.0
500S-850E	4.82	201	74	206	23	8.6
1000S-850E	4.95	282	74	156	23	10.0
North-South Transect at 70°33.5						
1000N-1850E	0.72	-	41	75	12	-
500N-1850E	2.90	170	61	124	20	7.6
500S-1850E	4.60	282	70	152	21	8.6
$\bar{X}$	3.45	512.43	65.38	157.88	28.00	9.01
σ	1.55	386.71	18.16	42.36	11.89	0.85

Table IV-3-2c.(S.A.I.C., 1985).

Results of Chemical Analysis-Foul Area
East-West - April 1983

Location	% Volatiles NED	ppm Oil & Grease	ppm Cr	ppm Zn	ppm Cu	ppm As
400W	2.22	6,510	444	469	114	10.2
275W	3.66	1,830	225	266	100	5.4
150W	4.39	2,790	215	285	100	5.8
50W	2.99	1,840	176	168	81	5.2
CTR	1.65	158	38	92	17	5.0
850E	4.22	1,210	90	196	43	10.0
$\bar{X}$	3.19	2389.67	198.00	246.00	75.83	6.93
σ	1.10	2196.58	140.91	129.58	37.92	2.47

SAIC

Table IV-4-1. (S.A.I.C., 1985).

Results of Chemical Analysis- Foul Area-South
January Cruise - 1983

Location	Volatile NED	ppm O&G	ppm Hg	ppm As	ppm Pb	ppm Cr	ppm Cu	ppm Zn
500N	0.95	1200	0.13	8.6	68	111	55	166
250N	4.63	620	0.07	7.1	75	135	61	156
250S	5.31	230	0.07	-	43	101	28	114
500S	5.47	240	-	10.2	37	91	21	91
CTR	5.45	310	0.16	4.7	39	93	35	118
500W	3.95	220	0.10	-	38	86	31	209
250W	5.61	320	0.11	9.3	48	96	31	139
250E	1.29	-	0.16	-	15	54	26	169
500E	5.87	270	0.08	5.1	35	113	27	132
REF-A	4.38	189	0.07	8.3	21	66	15	105
REF-B	4.92	110	0.09	-	23	75	17	91
REF-C	4.41	150	0.06	9.4	33	82	18	90

SAIC

JFK LIBRARY SITE PRIORITY POLLUTANT SCAN (September, 1986)
Base Neutral Compounds

Parameter	Detection Limits	Results in PPB 0644	0645	0646
1,3- Dichlorobenzene	380	ND	ND	ND
1,4-Dichlorobenzene	880	ND	ND	ND
bis(2-Chloroethyl) ether	1140	ND	ND	ND
Hexachloroethane	320	ND	ND	ND
1,2-Dichlorobenzene	380	ND	ND	ND
bis(Methyl-2-chloroethyl) ether	1140	ND	ND	ND
N-Nitroso-di-n-propylamine	1140	ND	ND	ND
Nitrobenzene	380	ND	ND	ND
Hexachlorobutadiene	180	ND	ND	ND
1,2,4 Trichlorobenzene	380	ND	ND	ND
Isophorone	440	ND	ND	ND
Naphthalene	320	ND	ND	ND
bis(2-Chloroethoxy) methene	1050	ND	ND	ND
Hexachloropentadiene	600	ND	ND	ND
2-Chloronaphthalene	380	ND	ND	ND
Acenaphthalene	700	ND	ND	ND
Acenaphthalene	380	ND	ND	ND
Dimetholphthalate	320	ND	ND	ND
2,6-Dinitrotoluene	1140	ND	ND	ND
Flourene	380	ND	ND	ND
4-Chlorophenyl phenyl ether	840	ND	ND	ND
2,4 - Dinitrotoluene	140	ND	ND	ND
Diethylphthalate	4400	ND	ND	ND
N-Nitrosodiphenylamine	380	ND	ND	ND
4-Bromophenyl phenyl ether	380	ND	ND	ND
Hexachlorobenzene	380	ND	ND	ND
Phenanthrene	1080	ND	ND	ND
Anthracene	380	ND	ND	ND
Di-n-butyl phthalate	500	ND	ND	ND
Flouranthene	440	ND	ND	ND
Pyrene	380	ND	ND	ND
Benzidine	8800	ND	ND	ND
Benzyl butyl phthalate	500	ND	ND	ND
Bis(2-Ethylhexyl) pthalate	500	ND	ND	1170
Benzo(a) anthracene	1560	ND	ND	ND
Chrysene	500	ND	ND	ND
3,3 - Dichlorobenzidine	3300	ND	ND	ND
Di-n-octylphthalate	500	ND	ND	ND
Benzo (b) fluoranthene	960	ND	ND	ND
Benzo (k) fluoranthene	500	ND	ND	ND
Benzo (a) pyrene	500	ND	ND	ND
Indeno (1,2,3 -cd) pyrene	740	ND	ND	ND
Dibenzo (a,h) anthracene	500	ND	ND	ND
Benzo (ghi) perylene	820	ND	ND	ND

JFK LIBRARY SITE PRIORITY POLLUTANT SCAN (September, 1986)
Volatile Organics

Parameter	Detection Limits	Results in PPB 0644	0645	0646
Benzene	5	ND	ND	ND
Bromodichloromethene	5	ND	ND	ND
Bromoform	5	ND	ND	ND
Bromoform	10	ND	ND	ND
Carbon tetrachloride	2	ND	ND	ND
Chloroethane	10	ND	ND	ND
2-Chloroethylvinyl either	5	ND	ND	ND
Chloroform	2	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Chloromethane	10	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
1,2 - Dichlorobenzene	5	ND	ND	ND
1,3 - Dichlorobenzene	5	ND	ND	ND
1,4 - Dichlorobenzene	5	ND	ND	ND
1,1 - Dichloroethane	2	ND	ND	ND
1,2 - Dichloroethane	2	ND	ND	ND
1,1 - Dichloroethane	2	ND	ND	ND
trans - 1,2 - Dichloroethene	2	ND	ND	ND
1,2 - Dichloropropane	2	ND	ND	ND
cis -1,3 - Dichloropropane	5	ND	ND	ND
trans-1,3 - Dichloropropane	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Methylene Chloride	2	ND	ND	ND
1,1,2,2 - Tetrachloroethane	2	ND	ND	ND
Tetrachloroethene	2	ND	ND	ND
Toluene	5	ND	ND	ND
1,1,1 - Trichloroethane	2	ND	ND	ND
1,1,2 - Trichloroethane	2	ND	ND	ND
Trichloreothene	2	ND	ND	ND
Trichlorofluoromethene	2	ND	ND	ND
Vinyl chloride	2	ND	ND	ND

JFK LIBRARY SITE PRIORITY POLLUTANT SCAN (September, 1986)
Organochlorine Pesticides and PCB's

Parameter	Detection Limits	Results in PPB 0644	0645	0646
Aldrin	200	ND	ND	ND
Dielrin	200	ND	ND	ND
p,p - DDT	600	ND	ND	ND
p,p - DDE	200	ND	ND	ND
p,p - DDD	600	ND	ND	ND
Endosulfan I	200	ND	ND	ND
Endosulfan II	200	ND	ND	ND
Endosulfan sulfate	600	ND	ND	ND
Endrin	200	ND	ND	ND
Endrin aldehyde	600	ND	ND	ND
Heptachlor	100	ND	ND	ND
Heptachlor epoxide	100	ND	ND	ND
a-BHC	100	ND	ND	ND
b-BHC	100	ND	ND	ND
g-BHC (lindane)	100	ND	ND	ND
d-BHC	100	ND	ND	ND
Toxaphene	1000	ND	ND	ND
Chlordane	1000	ND	ND	ND
PCB 1018	1000	ND	ND	ND
PCB 1221	1000	ND	ND	ND
PCB 1232	1000	ND	ND	ND
PCB 1242	1000	ND	ND	ND
PCB 1248	1000	ND	ND	ND
PCB 1254	1000	ND	ND	ND
PCB 1280	1000	ND	ND	ND

JFK LIBRARY SITE PRIORITY POLLUTANT SCAN (September, 1986)
Acid Extractibles

Parameter	Detection Limits	Results in PPB 0644	0645	0646
2-Chlorophenol	600	ND	ND	ND
2-Nitrophenol	700	ND	ND	ND
Phenol	300	ND	ND	ND
2,4 - Dimethylphenol	500	ND	ND	ND
2,4 - Dichlorophenol	500	1130	ND	2300
2,4,6 - Trichlorophenol	500	1320	ND	ND
4 - Chloro-3-methylphenol	600	ND	ND	ND
2,4 - Dinitropnenol	8000	ND	ND	ND
2-Methyl-4,6-dintrophenol	5000	ND	ND	ND
Pentachlorophenol	700	ND	ND	ND
4-Nitrophenol	500	ND	ND	ND

ND= Not Detected
NS= No sample

Appendix IA

Harbor, rivers and channels that have the potential to dispose of dredged material at FADS.

Rockport Harbor and Pigeon Cove
Gloucester Harbor, Annisquam River, and Smith Cove
Essex River and Castle Neck River
Ipswich River and Eagle Hill River
Rowley River
Manchester Harbor
Beverly Harbor
Danvers, Gane, and Porter Rivers
Salem Harbor
Marblehead Harbor
Lynn Harbor
Swampscott Harbor
Winthrop Harbor
Saugus/Pines River
Malden River
Mystic River
Boston Harbor and Nantasket Beach Channel (Wier River) including:
- Chelsea River
- Fort Point Channel
- Little Mystic (South) Channel
- Boston Inner Harbor
- East Boston Harbor
- Charles River
- President Roads Anchorage
- Reserved Channel
- Main Ship Channel (Broad Sound, North, South and Narrows Channel)
- Nubble Channel
- Island End River
- Dorchester Bay and Neponset River
- Weymouth Fore, Town, and Back Rivers

Allerton Harbor
Hingham Harbor
Weir River including Nantasket Channel and Sagamore Cove
Cohasset Harbor
Scituate Harbor
Green Harbor
Duxbury Harbor
Kingston Harbor
Plymouth Harbor and Cordage Channel

SECTION A

APPENDIX II

BIOLOGICAL SURVEY REPORT

BR-IAB-85-6

Biological Report:

Columbia Point, Boston Harbor, MA
10 and 19 December 1985
6 March 1986

William A. Hubbard
Marine Ecologist

Ernest R. Waterman
Geologist

Elizabeth A. Parfenuk
Biologist

INTRODUCTION:

On 10 and 19 December 1985, Mr. Hubbard and Mr. Waterman performed intertidal sampling at the two proposed locations of a pier and channel providing access to the J.F. Kennedy Library in Boston, MA. The purpose of this sampling was to assess the intertidal environments and characterize the subtidal environment. This sampling was performed to assist in the preparation of an Environmental Assessment concerning impacts from the proposed Kennedy Library Dock. Additional sampling was also performed on 6 March 1986 by Mr. Hubbard and Ms. Parfenuk. All of these sampling efforts were timed for negative low tides.

The sampling area was adjacent to Columbia Point approximately three kilometers southwest of Castle Island in Boston Harbor, Boston, Massachusetts. This area of Dorchester Bay has a mean tidal range of 2.9 meters (9.5 feet) and a spring range of 3.3 meters (11 feet) (N.O.A.A., 1986) as reported for Castle Island at 42°20' latitude and 71°01' longitude. The combined currents for Dorchester Bay through Thompson Island has a 41.2 cm/sec (0.8 knot) maximum flood running west by north (281° true) and a maximum ebb of 30.8 cm/sec (0.6 knot) running east by 1/4 north (086° true). Air temperatures were 3.5°C and -2.75°C on 10 and 19 December 1985 and 2.5°C on 6 March 1986. Water temperature was 4.5°C on 10 December 1985; 3.5°C on 19 December 1985 and 4.0°C on 6 March 1986. Salinity was measured on 6 March 1986 as 26.0%.

MATERIALS AND METHODS:

Sampling of the intertidal habitat occurred by placing three random 20cm by 20cm grids, one meter apart, on the subtrate. All epifaunal organisms within the grid were identified to species and enumerated. The grids were excavated to a depth of 20cm and screened through a 1.0 mm sieve. Those organisms on the screen were also enumerated. Where it was not possible to identify an organism in the field, they were preserved in 10% buffered formalin, labeled and returned to the laboratory for identification. Field notes were made of the substrate, algal cover and waterfowl present (Tables 1, 2, 3, and 4).

The subtidal environment was sampled at Stations 1 and 2 using 1.0 liter hand cores. These cores were forced into the sand substrate and closed in place. The substrate was then immediately washed thorough a 0.5 mm sieve, labeled, placed in a jar, and preserved in 10% buffered formalin with rose bengal. The rose bengal is a bright red vital stain that allows for easy identification of living tissue when separating from debris. The sample was allowed to stand for one week in the formalin and rose bengal solution and was then hand sorted and preserved in 70% ethyl alcohol. The whole organisms and anterior ends of partial organisms in the samples were taxonomically identified through microscopic techniques and the results are listed in Tables 5, 6, 7, and 8. Table 9 lists temperatures and salinity at the time of sampling. Table 10 lists the taxonomic classification of all species recovered and the common names, when available.

Statistical analysis of the four replicate hand cores from each station sieved through a 0.5mm screen provides a description of the benthic communities of the two sites at that particular time of sampling. This analysis should not be construed as a definitive description of the benthic community, which would require seasonal sampling and additional stations. The inclusion of the calculation of Shannon (H'log 10) Diversity and Evenness (J' log 10) provides a static qualification of a dynamic community. Shannon Diversity value (H') is a unitless number that provides an expression of the distribution of observations among categories. In this case the distribution or number of individuals among species. The maximum possible diversity attainable is a logarithmic function of the number of species present. Evenness (J') is the proportion of the observed diversity to the maximum attainable diversity and therefore an indication of homogeneity or relative diversity (see Results). These statistics are applied here only as a descriptive reference between the two stations sampled.

RESULTS:

Columbia Point in Boston Harbor was sampled at two areas (see Figure A6). The first area was on a transect perpendicular to the balustrade eight balusters south of the navigation light at the corner of the John F. Kennedy Library. This area was termed the "Library Site", Station 1. The second sampling area was 75 meters (250') south of an abandoned pump house (hence "Pump House Site") and on a transect perpendicular to the thirteenth baluster on the balustrade. The intertidal area on this transect (Station 2) and the intertidal and subtidal components of Station 3 were sampled (see Figure A6). The observation of intertidal sand flats exposed at extreme tides and the question of shellfish in the project area, prompted a return on 6 March 1986 to sample for shellfish. The excavations for shellfish involved four grids to 20 cm, screened through a 1.0 mm sieve. These were taken at Station 4 in 0.3 m (1 foot) of water at the extreme low tide.

LIBRARY SITE

The Library Site had an intertidal slope of approximately 45^{o} down the rock revetment along the balustrade. The top 2.8 m (9.2') of the slope is supratidal and the spring tide mark, proceeding seaward down the slope has a 2.3 m (7.5') band of *Balanus* sp. (barnacles). The algal cover begins here with a 2.3 m (7.5') band of *Fucus vesiculosus* (rockweed) transitioning at the low intertidal zone into *Chondrus crispus* (Irish moss) and *Mytilus edulis* (blue mussel) beds. The substrate at the toe of the slope was gravel/shell/sand with intermittent boulders. Proceeding subtidally seaward 48 meters (157.4') of shell/sand substrate was observed with the 48 (157.4') to 70 m (230') mark sandy with occasional shell. From here the substrate slopes deeper subtidally and is of a higher silt content.

STATION 1

Station 1 epifaunal and infaunal grids were taken on blue mussel, Mytilus edulis, beds and in silty sand substrate similar to the proposed dredging area. The byssal threads form a mat adhering live Mytilus edulis shells, empty shells and pebbles to each other and the rocky substrate. Under the mussel bed is a silty sand substrate interspersed with boulders.

Analysis of that portion of the biota retained on a 1.0mm sieve revealed approximately 237 organisms per square meter from 15 species (Table 1). The dominant organism was the suspension feeding gastropod Crepidula plana (the flat slipper shell) at approximately 962.8/m^2 (one square meter equals 10.76 square feet). The suspension feeding blue mussel, Mytilus edulis, was the next dominant at approximately 390.1/m^2. The mussel population had an average length of 5.5cm (S.D. = 0.9). The third dominant organism was the slipper shell, Crepidula fornicata at approximately 257.3/m^2. The high numbers of gastropods is a result of the winter set and many of these were very small (<0.5 cm).

The macrobenthic infauna at Station 1 was characterized by analyzing four one liter (0.01m^2) hand cores as indicated in the materials and methods section. Table 5 lists the results of the laboratory analyses and Table 7 approximates the density of organisms per square meter. The calculation of the diversity (H') and evenness (J') do not include the nematodes (Phylum Aschelminthes), which are better classified as meiofauna (Table 7).

The benthic community at Station 1 averaged 21,325 individuals per square meter from 14 species. The dominant organisms were the oligochaete Peloscolex benedeni (8550/m^2); the polychaete Capitella capitata (identified here as one species: 3700/m^2); the polychaete Streblospio benedicti (2875/m^2) and the gastropod Crepidula fornicata (2050/m^2). A varied population of crustaceans was also represented (Table 7). Calculation of the Shannon Diversity Index revealed an H' of 0.7556 and an Evenness of 0.6592. (Calculation of these without Peloscolex benedeni reveal H' = 0.7731 and J' = 0.6940, closely resembling the overall community structure.) These indices depict a moderately even distribution of individuals among species, maximum homogeneity of density among species would approach 1.0, J' at this station was 0.6592 (see also Discussion).

PUMP HOUSE SITE

The Pump House Site also had an intertidal slope of approximately 45° down a rock revetment from the 13th baluster of the Columbia Point balustrade south of the Pump House. A 7.5 meter (24.6') band of barren rock slopes from the balustrade to the top of a 4.6 meter(15.1') band of Fucus vesiculosus (rockweed). The bottom of this zone reaches a 2.4 meter (7.9') band of Chondrus crispus (Irish moss) with associated mussels (Mytilus edulis) in this lower intertidal zone. Station 2 was established in the subtidal zone, of this transect (see Figure 6). Three epifaunal/infaunal grids on rock and four replicate hand cores were taken at Station 2 in silty sand substrate of the same nature as the proposed dredging area, slightly north of the station (Figure A6). Station 3 was sampled by three $20cm^2$ grids on the lower (*Chondrus crispus*/*Mytilus edulis*) intertidal rocky/sand area north of the 13th baluster transect. Station 4 was a series of four epifaunal and infaunal $20cm^2$ grids on the sandy substrate north of the transect line (see Figure 6).

Station 2

The three $20cm^2$ grids on the rocky intertidal area sieved through a 1.0mm screen retained approximately 356.9 organisms/m^2 from five species. The dominant organisms were the gastropod *Littorina littorea* (257.3/m^2) and the blue mussel *Mytilus edulis* (74.7/m^2 with a mean length of 4.8cm - S.D. = 0.6). The remaining three organisms were all third rank at approximately 8.3/m^2 (one organism recovered from three grids); the suspension feeding gastropod *Crepidula fornicata*; the deposit feeding polychaete *Glycera robusta* and the sessile tunicate *Molgula retortiformis*.

The macrobenthic infaunal community at Station 2 was characterized by analyzing four one liter ($0.01m^2$) hand cores. Table 6 lists the results of the laboratory analyses and Table 8 approximates the density of organisms per square meter. The calculation of H' and J' does not include the nematodes, which are better classified as meiofauna (Table 8).

The benthic community at Station 2 averaged 3,925.0 organisms per square meter from four species. The dominant organisms were the oligochaete *Peloscolex benedeni* (2,225/m^2), the polychaete *Capitella capitata* (1,575/m^2) and the polychaete *Streblospio benedicti*. These three species are dominant over nematodes (350/m^2) and *Littorina littorea* (25/m^2). Calculation of H' reveals moderate values; H' = 0.3535 and J' = 0.5871, reflective of the four species present at the site. (Calculation of these without *Peloscolex benedeni* reveal an H' = 0.1301 and J' = 0.2726, reflecting the dominance of *Capitella capitata*)

Station 3

The three $20cm^2$ grids were placed on the low intertidal zone in an area of sand with shell. Grids A, B, and C were excavated to a depth of 20cm. Grid A contained no infauna or epifauna. Analysis of total densities from the 1.0mm sieve revealed approximately 431.6 organisms per square meter from three species. The blue mussel *Mytilus edulis* dominated the station in densities of 373.5/$meter^2$ (mean length of 3.65cm, S.D. = 1.2). The two other organisms recovered at Station 3 were the gastropods *Littorina littorea* (49.8/m^2) and *Crepidula fornicata* (8.3/m^2). This station represents the ecotone between the low intertidal mussel beds and the sand substrate interspersed with boulders and attached mussels.

Station 4

The necessity for sampling at Station 4 evolved from the observation of shallow to intertidal sand flats exposed during the 10 December 1985 negative tide. The proper tide to expose the flats reoccurred on 6 March 1986, but unfavorable winds prevented its full exposure. To determine if any clams occurred in the flats, four random $20cm^2$ grids were excavated to 20cm. The results of this sampling revealed 56.25 organisms per square meter (1.0mm sieve) from five species. The polychaets Glycera robusta and Spio filicornis were co-dominants at $18.75/m^2$. No Mya arenaria were found after sieveing all four grids (20cm deep) through a 1.0 sieve.

DISCUSSION:

The winter environment at the two proposed dredging/pier construction sites was described using four stations (see Figure A6) and a total of eight 1.0 liter hand cores (Stations 1 and 2) and 13, 20cm x 20cm epifaunal grids excavated to 20cm, where possible, for infaunal analysis

The results of these analyses have been discussed with local researchers (i.e. Dr. Gallagher - University of Mass.) and seem to be in agreement with other data available for the area.

The benthic population data obtained by sieving through a 1.0 mm sieve can only be considered descriptive, since many of the smaller organisms will be washed through the mesh. Use of the 1.0 liter hand cores and 0.5 mm sieve provide an excellent sample, but small in aerial coverage ($0.01\ m^2$). It is also not possible to describe a benthic community by two stations of four replicates in the winter season. The data presented here on the communities is only analyzed statistically to allow the reader a description that can be compared between stations. In analyzing the variance between replicates of hand cores, Station 1 has good results, 18.9% relative variance in the number of individuals between cores and 5.1% between number of species. Station 2 has high variances; 60.6% realtive variance in number of individuals between replicates; and 38.7% variance in number of species between replicates. The high variance in Station 2 data can be attributed to the low number of individuals and species recovered.

The benthic fauna at Station 1 averaged 21,325 individuals per square meter from 14 species. The dominant organisms were the oligochaete Peloscolex benedeni ($8550/m^2$); the polychaete Capitella capitata (identified here as one species: $3700/m^2$); the polychaete Streblospio benedicti ($2875/m^2$) and the gastropod Crepidula fornicata ($2050/m^2$). A varied population of crustaceans was also represented (Table 7). Calculation of the Shannon Diversity Index revealed an H' of 0.7556 and an evenness of 0.6592. These indices depict a moderately even distribution of individuals among species, maximum homogeneity would approach 1.0, J' at this station was 0.6592.

The epifaunal communities, associated with the rocky intertidal substrates covered with mussles and algae such as Fucus vesiculosus and Chondrus crispus, was dominated by the suspension feeding gastropod Crepidula plana, the flat slipper shell, at approximately 962.8 per square meter. The blue mussel Mytilus edulis was found to be the next dominant at approximately $390.1/m^2$ with an average length of 5.5cm (S.D. = 0.9). The third dominant organism was the slipper shell Crepidula fornicata approximately $257.3/m^2$. These organisms are typically associated with mussel beds, the suspension feeding gastropods existing commensally with the mussel bed. The nutrients necessary to maintain a suspension feeding community are filtered by all three dominants from the water column. This activity is possible by the currents providing a constant flow of nutrients across the bed, while also not allowing silts to accumulate on the bed. Siltation could clog the gills and feeding structures of the suspension feeding organisms. The bed itself is formed as a mat above the substrate, collecting feces below by reducing currents flowing across the substrate.

The dominants of the benthic infaunal community are often found in association with each other (Pearson and Rosenberg, 1978) each having the ability, as a species, to exploite environmentally stressed niches. The dominants (Peloscolex benedeni, Capitella capitata and Streblospio benedicti) are annelid oligochaetes and polychaetes that digest the substrate's detrital/organic component (e.g. non-selective deposit feeders) as they burrow through the sediment. The H' Diversity and J' Evenness of this site and the presence of crustaceans (approximately $2000/m^2$) indicates that although stress tolerant species have successfully exploited the environment, as they can exploit most environments, a generally healthy community exists here. The detrital organic input from the mussel beds may provide the dominants with an advantage in competing with other community members. The definitive description of complex community interactions such as this require seasonal monitoring through a long time frame. From this one-time sampling, we can only infer that the populations of benthos at the Library Site are not unique and if disturbed (i.e. dredged) recolonization will occur from ambient Boston Harbor environments, by both larval and adult recruitment, within a series of spawning seasons, culminating in full recolonization over approximately one year.

The macrobenthic infaunal community at the Pump House Site, Station 2 was characterized by analyzing four, one liter ($0.01m^2$) hand cores. Table 6 lists the results of the laboratory analyses and Table 8 approximates the density of organisms per square meter.

The benthic community sampled by the replicate hand cores at Station 2 averaged 3,925.0 organisms per square meter from four species. The dominant organisms were the oligochaete Peloscolex benedeni ($2,225/m^2$), the polychaete Capitella capitata ($1,575/m^2$) and the polychaete Streblospio benedicti ($100/m^2$). These three species are dominant over

Littorina littorea ($25/m^2$). Calculation of H' reveals moderate values; H' = 0.3535; and J' = 0.5871, reflective of the four species present at the site.

The Pump House Site macrofaunal component sampled by ten 20cm by 20cm epifaunal grids, excavated where possible to 20cm, was dominated by the blue mussel *Mytilus edulis* at approximately $27.0/m^2$ (mean length = 4.2cm) and the common periwinkle at a density of approximatley $18.5/m^2$. The other species recovered were generally single occurrences that cannot be considered dominants. The presence of *Mytilus edulis* and *Littorina littorea* is a function of those species exploiting the rocky intertidal substrate. The low densities, as compared to the Library Site is indicative of the general ecological health of the site.

CONCLUSION:

The low numbers of individuals distributed among a narrow diversity of species (*Peloscolex benedeni*, *Capitella capitata* and *Streblospio benedicti*) at the Pump House Site, as compared to the Library Site, indicates a stressful environment. These three annelids, in low numbers, are the entire benthic community, not having the diversity that the crustaceans provide at Station 1. These species have been identified as common inhabitants of organically enriched environments and as having the ability to rapidly colonize disturbed areas (Pearson and Rosenberg, 1978).

The tolerance of these species to stresses of high organic/low oxygen concentration, physical alterations to their environment and various contaminant concentrations is a function of the high spawning rate, tolerant larval stages and successful larval recruitment in stressed environments. For these reasons, this species complex is often characteristic of urban estuaries. Through time, as urbanization in some coastal habitats has impacted water quality, certain species have evolved to successfully exploit stressed niches, out competing other, less tolerant species. The specific stresses controlling the benthic population structure can only be theorized from this limited sampling. The chemical characteristics determined for the Pump House Site (see Section E1 of the Environmental Assessment) are significantly more contaminated than the Library Site and therefore suspect as the most probable controlling factor.

Although Dorchester Bay has areas of significant clam densities (*Mya arenaria*) only one individual was collected among all stations and replicates during this sampling program. The density of clams (*Mya arenaria*) at either site is therefore not assumed to be significant.

Table 1. Species and individuals from Station 1 intertidal sampling at the proposed Kennedy Library dock site. December 1985, ($20cm^2$ grids and a 1.0 mm sieve).

Species	Grid A	B	C	Total
Phylum Mollusca				
Class Gastropoda				
Crepidula fornicata	31			31
Crepidula plana	116			116
Littorina littorea	2	3	2	7
Class Bivalvia				
Mytilus edulis	10	25	22	47
(mean length = 4.4cm, S.D. - 1.6)				
6.1cm, S.D. - 1.8)				
5.9cm, S.D. - 1.7)				
Mya arenaria (2.5cm)			1	1
Phylum Annelida				
Class Polychaeta				
Lepidonotus squamatus	1	1	2	4
Harmothoe imbricata	3	1	3	7
Nereis virens			1	1
Class Oligochaeta				
Peloscolex benedeni				
Phylum Arthropoda				
Class Crustacea				
Ampelisca vadorum			1	1
Carcinus maenas	3	8	4	15
Crangon septemspinosa	1			1
Neopanope texana (sayi)	1			1
Phylum Echinodermata				
Class Stelleroidea				
Asterias vulgaris (17.5cm)		1		1
Phylum Chordata				
Class Ascidiacea				
Molgula retortiformis	1		1	2
Class Osteichthyes				
Pholis gunnelus (6.9cm, 5.1cm, 5.6c,)	1	1		2

Ni=Number of individuals = 237
Ns=Number of species = 15

Comments: The substrate consists of a byssal thread mat formed by blue mussels adhering to shell, pebbles and debris. Underlying this habitat is silty sand and mussel feces. The substrate was excavated to a depth of 20cm and consisted of gravel/shell/sand. Intertidal revetment was covered with a 2.9 m band of <u>Mytilus edulis</u>, rock and <u>Chordrus crispus</u> at the toe, sloped 45^{o} upward with 2.3m of <u>Fucus vesiculosus</u>, then 2.3 m of <u>Balanus</u> sp. and then 2.8 to the top of embankment.

Table 2. Species and individuals from Station 2 intertidal sampling at the proposed Kennedy Library dock site. December, 1985 ($20cm^2$ grids and 1.0mm sieve).

Species	Grid	A	B	C	Total
Phylum Mollusca					
Class Gastropoda					
Crepidula fornicata		1			1
Littorina littorea		14	8	9	31
Class Bivalvia					
Mytilus edulis		6		3	9
(mean length = 5.2cm, S.D. = 1.4)					
(mean length = 4.4cm, S.D. = 1.2)					
Phylum Annelida					
Class Polychaeta					
Glycera robusta		1			1
Phylum Cordata					
Class Ascidiacea					
Molgula retortiformis			1		1
				Ni =	43
				Ns =	5

Comments: Epifaunal community attached to rock revetment at lowest littoral area. Revetment continues subtidally to Station 2. A 2.4 m band of *Chondrus crispus* slopes to a 4.6m band of *Fucus vesiculosus* and then 7.5m to top of slope.

Table 3. Species and individuals from Station 3 and intertidal sampling at the proposed Kennedy Library dock site. December, 1985 ($20cm^2$ grids and a 1.0mm sieve).

Species	Grid	A	B	C	Total
Phylum Mollusca					
Class Gastropoda					
Crepidula fornicata				1	1
Littorina littorea			6		6
Class Bivalvia					
Mytilus edulis			14	31	45
(mean length = 3.6cm, S.D. = 1.2)					
(3.7cm, S.D. = 1.1)					
					Ni = 52
					Ns = 3

Table 4 Species and individuals from Station 4 subtidal and intertidal sampling of the proposed Kennedy Library dock site. 6 March 1986 ($20cm^2$ grids and a 1.0 mm sieve).

Species	Grid	A	B	C	Hl.
Phylum Mollusca					
Class Bivalvia					
Barnea truncata				1	
Phylum Annelida					
Class Polychaeta					
Lepidonotus squamatus					1
Glycera robusta		1	2		
Nephtys incisa		1			
Spio filicornis		1	2		

Comments: Coarse dark sand/shell with high retention on the 1.0mm sieve. Area is exposed intertidal only at extreme tides (see Figure A6).

Table 5. Species and individuals from Station 1 subtidal sampling at the proposed Kennedy Library dock site. December, 1985 (1.0 liter hand cores and a 0.5mm sieve)

Species	Grid A	B	C	D
Phylum Aschelminthes				
Class Nematoda				
Nematod A	90	132	101	100
Phylum Mollusca				
Class Gastropoda				
Acmaea testudinalis	1			
Crepidula fornicata	10	24	36	12
Crepidula plana		25		
Littorina littorea			1	1
Class Bivalvia				
Mya arenaria	1			1
Phylum Annelida				
Class Polychaeta				
Nereis virens	2			
Capitella capitata	38	47	29	34
Streblospio benedicti	11	23	17	64
Polydora ligni	11	8	7	28
Class Oligochaeta				
Peloscolex benedeni	97	116	63	66
Phylum Arthropoda				
Class Crustacea				
Ampelisca vadorum				1
Dexamine thea	15	15	10	36
Aeginina longicornis			1	
Carcinus maenas		1	1	
(female 3.2cm) (female 3.6cm) (female 3.4cm)				
Ni =	276	391	266	355
Ns =	10	9	10	10

Relative S.D.=
Ni = 18.9%
Ns = 5.1%

Table 6. Species and individuals from Station 2 subtidal sampling at the proposed Kennedy Library dock site. December, 1985 (1.0 liter hand cores and a 0.5mm sieve).

Species	Grid	A	B	C	Hl.
Phylum Aschelminthes					
Class Nematoda		2	5	7	
Nematode A					
Phylum Mollusca					
Class Gastropoda					
Littorina littorea		1			
Phylum Annelida					
Class Polychaeta					
Capitella capitata		17	6	21	19
Streblospio benedicti		4			
Class Oligochaeta					
Peloscolex benedeni		10	9	63	7
	Ni =	34	20	71	26
	Ns =	5	3	3	2

Relative S.D. =
Ni = 60.6%
Ns = 38.7%

Table 7. Species and individuals from Station 1 subtidal sampling at the proposed Kennedy Library dock site. December, 1985

	$\#/0.04m^2$	$\#/m^2$
Phylum Aschelminthes		
Class Nematoda		
Nematod A	(423)	(10,575)
Phylum Mollusca		
Class Gastropoda		
Acmaea testudinalis	1	25
Crepidula fornicata	82	2,050
Crepidula plana	25	625
Littorina littorea	2	50
Class Bivalvia		
Mya arenaria	2	50
Phylum Annelida		
Class Polychaeta		
Nereis virens	2	50
Capitella capitata	148	3,700
Streblospio benedicti	115	2,875
Polydora ligni	54	1,350
Class Oligochaeta		
Peloscolex benedeni	342	8,550
Phylum Arthropoda		
Class Crustacea		
Ampelisca vadorum	1	25
Dexamine thea	76	1,900
Aeginina longicornis	1	25
Carcinus maenas	2	50
Ni = Total number of individuals/m^2 =		21,325
Ns = Total number of species/m^2 =		14
H' = Shannon Diversity Index =		0.7556
J' = Evenness Index =		0.6592

Table 8. Species and individuals from Station 2 subtidal sampling at the proposed Kennedy Library dock site. December, 1985 (1.0 liter hand core and a 0.5mm sieve).

	$\#/0.04m^2$	$\#/m^2$
Phylum Aschelminthes		
Class Nematoda		
Nematode A	(14)	(350)
Phylum Mollusca		
Class Gastropoda		
Littorina littorea	1	25
Phylum Annelida		
Class Polychaeta		
Capitella capitata	63	1,575
Streblospio benedicti	4	100
Class Oligochaeta		
Peloscolex benedeni	89	2,225
Ni = Total number of individuals/m^2 =		3,925
Ns = Total number of species/m^2 =		4
H' = Shannon Diversity Index =		0.3535
J' = Evenness Index =		0.5871

Table 9 Physical parameters during sampling at proposed Kennedy Library Dock in Boston, MA.

		10 December 1985
Air Temperature	:	3.5°C
Water Temperature	:	4.5°C
Sediment Temperature	:	1.5°C
		19 December 1985
Air Temperature	:	-2.75°C
Water Temperature	:	3.5°C
Sediment Temperature	:	2.0°C
		6 March 1986
Air Temperature	:	2.5°C
Water Temperature	:	4.0°C
Sediment Temperature	:	4.0°C
Salinity (0.3m)	:	26.0 0/00

Table 10. Species list from subtidal and intertidal sampling at the proposed Kennedy Library dock site. December, 1985.

Phylum Aschelminthes
   Class Nematoda
      Nematode A

Phylum Mollusca
   Class Gastropoda
      Acmaea testudinalis - Tortoiseshell Limpet
      Crepidula fornicata - Common Slipper Shell
      Crepidula plana - Flat Slipper Shell
      Littorina littorea - Common Periwinkle
   Class Bivalvia
      Mytilus edulis - Blue Mussel
      Mya arenaria - Soft Shell Clam

Phylum Annelida
   Class Polychaeta
      Lepidonotus squamatus - Scale Worm
      Harmothoe imbricata - Scale Worm
      Glycera robusta - Blood Worm
      Nephtys incisa - Red-lined Worm
      Nereis virens - Clam Worm
      Capitella capitata - Capitellid Thread Worm
      Spio filicornis
      Streblospio benedicti - Mud Worm
      Polydora ligni - Mud Worm
   Class Oligochaeta
      Peloscolex benedeni

Phylum Arthropoda
   Class Crustacea
      Ampelisca vadorum
      Dexamine thea
      Aeginina longicornis
      Carcinus maenas - Green Crab
      Crangon septemspinosa - Sand Shrimp
      Neopanope texana (sayi) - Mud Crab

Phylum Echinodermata
   Class Stelleroidea
      Asterias vulgaris - Starfish

Phylum Chordata
   Class Ascidiacea
      Molgula retortiformis - Sea Grapes
   Class Osteichthyes
      Pholis gunnelus - Rock Eel

SECTION A

APPENDIX III

BIOASSAY

AND BIOACCUMULATION

TEST RESULTS

ECOLOGICAL EVALUATION OF PROPOSED OCEANIC DISCHARGE OF DREDGED MATERIAL FROM THE VICINITY OF THE JFK LIBRARY, BOSTON, MASSACHUSETTS

- Toxicity and Bioaccumulation Tests with Solid Phase of Material -

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December 1986

SUMMARY

Material proposed to be dredged from the vicinity of the JFK Library in Boston, Massachusetts, and discharged at a nearby disposal area is evaluated in this report. The solid phase of three samples of dredged material (samples H, I, and J) was evaluated. Survival of grass shrimp (*Palaemonetes pugio*), hard clams (*Mercenaria mercenaria*), and sandworms (*Nereis virens*) exposed for 10 days to the solid phase of the material was not significantly less than survival of organisms exposed for the same period of time to reference sediment. Tissues of organisms that survived exposure to the solid phase of the material were never characterized by significantly elevated concentrations ($p = 0.05$) of xenobiotic constituents (cadmium, mercury, polychlorinated biphenyls [PCBs], the dichlorodiphenyl-trichloroethane family [DDT], and aromatic hydrocarbons) as compared to tissues of reference organisms.

TABLE OF CONTENTS

1. INTRODUCTION

This evaluation was performed for material proposed to be dredged from Boston, Massachusetts and discharged at a nearby dumping ground. The evaluation consists of four principal sections in addition to the Introduction. The first section, which precedes the Introduction, summarizes the results of the evaluation. The second section reviews the methods and materials employed in the evaluation. The third section presents important results of the evaluation and statistically based discussions (interpretations) of those results. The fourth section identifies literature cited in the evaluation.

Three appendices are included in the evaluation. Appendix A contains maps of the dredging and disposal sites. Appendix B contains all raw toxicity-related data (raw bioaccumulation-related data appear in the main body of the evaluation). Appendix C addresses selected quality-control procedures.

2. METHODS AND MATERIALS

The dredged material employed in this evaluation was a combination of surface grabs and sediment cores ranging in depth from 0.6-1.75 ft. collected by representatives of the New England Division of the Corps of Engineers and ERCO. The material was delivered on June 11 and November 23, 1986, to ENSECO's Aquatic Toxicology Laboratory, where it was immediately placed in cold storage (2-4°C).

The solid phase of the dredged material was evaluated for its toxicity- and bioaccumulation-related potential by protocols developed by the EPA and the Army Corps of Engineers (U.S. EPA and U.S. Army COE, 1977), as modified by selected procedures recommended by the New York District of the Corps (N.Y. District COE, 1982) and the New England District, Corps (N.E. Division COE, 1985). The solid phase was obtained by wet sieving (1.0-mm screen) the dredged material into a settling container, adding nonliving material remaining on the screen to the container, allowing all material to settle for 6 hr, decanting the supernatant water, and homogenizing the residual material. The sieving and settling was performed at 20 ± 1°C in an environmental chamber.

Species employed in the toxicity tests (bioassays) with the solid phase of dredged material were the grass shrimp (*Palaemonetes pugio*), hard clam (*Mercenaria mercenaria*), and sandworm (*Nereis virens*). Hard clams and sandworms were acquired from commercial suppliers in Long Island, New York, and Boston, Massachusetts, respectively. Grass shrimp were collected off the Massachusetts coast. All organisms were acclimated in natural seawater for at least 10 days prior to initiation of testing. Grass shrimp, hard clams, and sandworms were tested in the same aquaria without the use of special segregation containers, i.e., Nitex containers; however, several glass vials were placed in each aquarium to serve as hiding places for grass shrimp. Grass shrimp and sandworms were fed commercially prepared, contaminant-free dry food daily throughout the 10-day test.

Test organisms were exposed to the solid phase of dredged material in five 38-liter aquaria (replicates), with each aquarium containing 20 individuals of each species and a 15-mm-thick layer of solid phase established on top of a 30-mm-thick layer of reference (disposal-site) sediment. In addition, organisms were exposed to five replicates of reference sediment (each replicate consisting of a 38-liter aquarium containing 20 individuals of each species and a 45-mm-thick layer of reference material) and five replicates of control (culture) sediment (each replicate consisting of a 38-liter aquarium containing 20 individuals of each species and a 45-mm-thick layer of control sediment). The aquaria were filled with seawater immediately after addition of sediment, and the flow through seawater system was turned on an hour later. Animals were added after one exchange of seawater had occurred.

Reference sediment was collected by representatives of the New England Division of the Corps of Engineers. Control sediment was obtained by laboratory representatives on June 12 and November 26, 1986 from the subtidal zone off Manchester, Massachusetts.

Bioassays (10-day tests) were performed at 20 ± 1°C, with filtered natural seawater collected from the Atlantic Ocean at Marblehead, Massachusetts being delivered to test aquaria by the flow-through method (six complete water exchanges per day, as documented by the use of a total of 10,800 gal of water during the tests). This seawater contained the following concentrations of constituents of interest: cadmium - 0.21 ppb, mercury - <0.2 ppb, DDT - <0.1 ppb, and PCB's - <0.1 ppb.

Seawater in aquaria was aerated to maintain levels of dissolved oxygen at or above 4 mg/l, and a 14-hr light and 10-hr dark photoperiod was maintained with cool-white fluorescent bulbs. Because dissolved oxygen levels fell below 4 mg/l in a small number of aquaria, the solid phase bioassay was repeated with additional samples of dredged material. All survival data is from tests performed on the second set of dredged material samples, and all bioaccumulation data is from tests with the first set of samples.

At the conclusion of the first solid-phase bioassays all surviving organisms from each aquarium (replicate) were placed in an aquarium containing clean, sediment-free water and allowed to void their digestive systems (sandworms were confined in Nitex containers to prevent predation by grass shrimp). Organisms were maintained under flow-through conditions for a period of 2 days. During that time, fecal material was removed from aquaria. At the end of the 2-day period, all samples of organisms were split into approximately equal amounts. One of those subsamples was placed in a polyethylene clean bag and frozen for later analyses of inorganic constituents. The second subsample was put in solvent-rinsed aluminum foil and frozen for analyses of organics. Prior to being chemically analyzed, biological samples were thawed and shells of hard clams were removed with acid-rinsed plastic utensils (inorganic analyses) and solvent-rinsed metal utensils (organic analyses). Samples of stock (pretest) organisms (three samples of each test species) were also split and processed as described above.

Biological samples (tissue samples) were analyzed for two inorganic constituents -- Cadmium (Cd) and Mercury (Hg) -- according to procedures described by Goldberg (1976) and the EPA (1979, 1980a). In the case of Cd, an aliquot of wet, homogenized tissue (approximately 0.3-0.6 g for grass shrimp and 5 g for hard clams and sandworms) was placed in a 100-ml, tall-form Pyrex beaker and frozen. Then, 10 ml of concentrated, Instra-analyzed (J.T. Baker Co.) nitric acid was added to the beaker and the sample was allowed to sit overnight, after which it was refluxed without boiling until the tissue was completely digested. After the sample was digested, it was evaporated to near dryness. Then, additional nitric acid (2 ml for grass shrimp and 5 ml for other species) and 30% Ultrex (J.T. Baker Co.) hydrogen peroxide (2 ml for grass shrimp and 5 ml for other species) were added to the beaker, and the sample was evaporated to near dryness. Finally, more nitric acid (1 ml) and 30% hydrogen peroxide (2 ml) were added to the beaker, and the sample was heated until oxidative frothing subsided. At that time, the sample was cooled, diluted to volume with deionized distilled water, and analyzed by graphite-furnace atomic absorption spectrophotometry (AAS).

For Hg, a separate aliquot of wet, homogenized tissue (about 0.3-0.6 g for grass shrimp and 5 g for hard clams and sandworms) was placed in a 300-ml glass BOD bottle and frozen. Approximately 10 ml (grass shrimp) or 20 ml (other species) of concentrated, Instra-analyzed sulfuric acid was placed in the bottle, and the sample was allowed to sit until the tissue was completely digested. Then, 2 ml (grass shrimp) or 5 ml (other species) of concentrated Instra-analyzed nitric acid were placed in the bottle, after which 100 ml of deionized distilled water, 15 ml of 5% Instra-analyzed potassium permanganate, and 8 ml of 5% Instra-analyzed potassium persulfate were added to the bottle. The sample was then heated at 55°C in a water bath for 2 hr. The resulting solution was analyzed by cold-vapor AAS after addition of reducing agents (12% hydroxylamine sulfate-sodium chloride and 10% stannous sulfate).

Tissue samples were analyzed for three types of organics -- PCBs, the DDT family, and aromatic hydrocarbons -- according to the basic procedures described by the EPA (1980b), Crump-Wiesner et al. (1974), the U.S. Food and Drug Administration (1977), and

Warner (1976). Tissue samples (approximately 1 g wet wt. for grass shrimp and 10 g for hard clams and sandworms) were thoroughly rinsed and placed in 50-ml centrifuge tubes, to which were added 10-ml aliquots of 10 N potassium hydroxide and "Resi-analyzed" grade methanol, and 5 µg of internal standard (O-terphenyl). After purging with nitrogen gas, the tubes were sealed and placed in a water bath at 90°C for 2 hr (tubes were shaken every 30 min). This saponification process, described above, digests the tissue, thereby releasing PCBs, DDTs, and hydrocarbons.

Three 15-ml portions of "Resi-analyzed" grade hexane were used to extract PCBs, DDTs, and hydrocarbons from the above-described methanol/potassium hydroxide digestate. The water soluble fraction was then discarded. The three extracts were combined, dried over a small volume (approximately 10 g) of sodium sulfate, and concentrated to 1 ml by rotary evaporation. The extracts were then cleaned, using alumina-column chromatography (employing, successively, 1 g sodium sulfate, 6.5 g of 7.5% deactivated alumina, and 1 g sodium sulfate), as follows. The 1-ml concentrate was charged to the top of the column and the column was eluted with 25 ml of hexane. The hexane was concentrated to 2 ml by rotary evaporation and further concentrated to 0.5 ml under a stream of purified nitrogen.

The hexane extract was weighed for total extractables and charged to a Warner chromatography column (wet packed with 10 g of 100% activated silica gel in dichloromethane and prepared by eluting with 30 ml each of dichloromethane and hexane). The column was eluted with 25 ml of hexane and then with 25 ml of 20% dichloromethane in hexane to separate, respectively, f_1 (aliphatic) and f_2 (mono- and diaromatic) compounds. After concentration by rotary evaporation, the f_2 fraction was analyzed by fused-silica capillary GC on a Hewlett-Packard 5840 or 5880 GC equipped with a splitless injection port and a flame ionization detector. Wall-coated open-tubular (WCOT) fused-silica columns (0.25 mm x 30 m, J&W Scientific, coated with DB-5 stationary phase) were used to analyze the fraction. Total concentrations of aromatic hydrocarbons were calculated by comparing the integrated areas of chromatogram peaks with the area of the internal standard, (O-terphenyl). It is important to emphasize that the techniques employed for hydrocarbon analysis -- Warner's techniques supplemented by several technical improvements, i.e., use of an alumina-column clean-up step, use of a "real" internal standard (standard added to homogenized tissue media as opposed to later sample extracts), which allow accurate corrections for incomplete recoveries -- are incapable of definitively distinguishing between biogenic (natural) and petroleum hydrocarbons unless the latter form predominates.

The above-identified f_2 fraction was also analyzed for PCBs and the DDT family by packed-column gas chromatography and electron-capture detection, employing a Hewlett-Packard Model 5840A or 5880 instrument equipped with a Ni^{63} detector. The column, a 6-ft x 2-mm I.D. glass instrument packed with 5% SP2401 or 1.95% SP2401 and 1.5% SP2250, was held isothermally at 200°C. The peaks in the f_2 fraction were quantified by comparing retention times and peak areas to those of external standards.

Results of the bioassay and bioaccumulation tests were interpreted by statistical techniques recommended by the U.S. EPA and U.S. Army COE (1977). When warranted, each data set generated in the studies was evaluated by Cochran's procedure to determine if variances of the data were homogeneous. If variances were homogeneous, a parametric, one-way analysis of variance (ANOVA) was used to determine if a significant difference existed between control organisms, reference organisms and organisms exposed to dredged material. If variances were not homogeneous as judged by Cochran's procedure, the data were transformed (natural logarithm of X + 1), and the transformed data were evaluated for homogeneity of variances by Cochran's technique. When transformed data were characterized by homogeneous variances, a parametric ANOVA and, if necessary, Student-Newman-Keul's Test were used to evaluate transformed data. When transformed data were characterized by heteroscedasticity, a nonparametric ANOVA and, if necessary, Wilcoxon-Mann-Whitney's Test were employed to interpret original data. In all statistical tests, the symbols "*" and "ns" are used to denote significant and nonsignificant differences, respectively at the 95% confidence level ($p = 0.05$).

3. RESULTS AND DISCUSSION

Toxicity tests and bioaccumulation tests are separately addressed in this section of the report.

3.1 Toxicity Tests

Raw toxicity-related data are presented in Table 1 and Appendix A.1. Mean survival of grass shrimp exposed for 10 days to control sediment, reference sediment, and the solid phase of dredged material was 98.0, 91.0, and 89.0-94.0%, respectively. Comparable values for hard clams were 100.0, 99.0, and 100.0%. Values for sandworms were 90.0, 89.0, and 85.0-94.0%.

Analysis of survival data for the three types of organisms exposed to control sediment, reference sediment, and the solid phase of dredged material is presented in Tables 2 and 3. Mean survival of control organisms was equal to or greater than 90%, thereby allowing evaluation of survival data observed with reference sediment and dredged material. When survival of control organisms was not included in the statistical analysis of the data (Table 2) survival of grass shrimp, hard clams, and sandworms exposed to samples H, I, and J, was never significantly lower than survival of organisms exposed to reference sediment. When control survival was included in the analysis (Table 3) survival of grass shrimp, hard clams, and sandworms exposed to samples H, I, and J was not significantly lower than reference or control survival. Total (combined) survival of the three organisms exposed to dredged material was never significantly lower than combined survival of organisms exposed to reference or control sediment, regardless of whether control survival data was included in the statistical analysis or not.

Table 3. Survival of grass shrimp (*Palaemonetes pugio*), hard clams (*Mercenaria mercenaria*), and sandworms (*Nereis virens*) exposed for 10 days to the solid phase of dredged material, control sediment, and reference sediment collected from the vicinity of the JFK Library

Organism	Replicate	Number of survivors: Control	Reference sediment	Dredged material sample H	Dredged material sample I	Dredged material sample J
Grass shrimp	1	19	20	16	19	20
	2	20	16	19	20	18
	3	19	19	16	18	16
	4	20	19	19	17	18
	5	20	17	19	20	17
	Mean	19.6	18.2	17.8	18.8	17.8
	Percent survival	98.0	91.0	89.0	94.0	89.0
Hard clams	1	20	19	20	20	20
	2	20	20	20	20	20
	3	20	20	20	20	20
	4	20	20	20	20	20
	5	20	20	20	20	20
	Mean	20.0	19.8	20.0	20.0	20.0
	Percent survival	100.0	99.0	100.0	100.0	100.0
Sandworms	1	17	20	18	19	17
	2	18	17	16	17	18
	3	16	17	14	20	16
	4	20	18	17	18	18
	5	19	17	20	20	16
	Mean	18.0	17.8	17.0	18.8	17.0
	Percent survival	90.0	89.0	85.0	94.0	85.0

Table 2. Statistical analyses of survival of grass shrimp (<u>Palaemonetes pugio</u>), hard clams (<u>Mercenaria mercenaria</u>), and sandworms (<u>Nereis virens</u>) exposed for 10 days to the solid phase of dredged material and reference sediment

	Cochran's test for homogeneity of variances of survival data				Parametric one-way analysis of variance (ANOVA) of survival data
Organism	Treatment	Mean	Variance	$C_{(cal)}$ [a]	$F_{(cal)}$ [b]
Grass shrimp	Reference sediment	18.2	2.7	0.29 ns	0.48 ns
	Dredged material H	17.8	2.7		
	Dredged material I	18.8	1.7		
	Dredged material J	17.8	2.2		
Hard clams	Reference sediment	19.8	Further analyses not warranted ($\bar{x}$ for reference sediment less than $\bar{x}$ for treatments)		
	Dredged material H	20.0			
	Dredged material I	20.0			
	Dredged material J	20.0			
Sand-worms	Reference sediment	17.8	1.7	0.53 ns	1.55 ns
	Dredged material H	17.0	5.0		
	Dredged material I	18.8	1.7		
	Dredged material J	17.0	1.0		
Total (combined)	Reference sediment	55.8	5.7	0.44 ns	1.43 ns
	Dredged material H	54.8	10.7		
	Dredged material I	57.6	3.3		
	Dredged material J	54.8	4.7		

[a]The value for $C_{(cal)}$ is compared to $C_{(tab)}$, which equals 0.63 for 0.05 probability level, k = 4, and v = 4. Variances are considered to be homogeneous (ns) if $C_{(cal)} \leq C_{(tab)}$. Otherwise, variances are considered to be heterogeneous (*).

[b]The value for $F_{(cal)}$ is compared to $F_{(tab)}$, which equals 3.24 for 0.05 probability level, numerator df = 3, and denominator df = 16. Mean tissue concentrations are considered to be nonsignificantly different (ns) if $F_{(cal)} \leq F_{(tab)}$. Otherwise, the difference is considered to be significant (*).

Table 3. Statistical analyses of survival of grass shrimp (*Palaemonetes pugio*), hard clams (*Mercenaria mercenaria*), and sandworms (*Nereis virens*) exposed for 10 days to the solid phase of dredged material, reference sediment, and control sediment

		Cochran's test for homogeneity of variances of survival data			Parametric one-way analysis variance of (ANOVA) of survival data
Organism	Treatment	Mean	Variance	$C_{(cal)}$ [a]	$F_{(cal)}$ [b]
Grass shrimp	Control sediment	19.6	0.3	0.28 ns	1.53 ns
	Reference sediment	18.2	2.7		
	Dredged material H	17.8	2.7		
	Dredged material I	18.8	1.7		
	Dredged material J	17.8	2.2		
Hard clams	Control sediment	20.0	Further analysis unwarranted ($\bar{x}$ for control and reference sediment less than or equal to $\bar{x}$ for treatments)		
	Reference sediment	19.8			
	Dredged material H	20.0			
	Dredged material I	20.0			
	Dredged material J	20.0			
Sandworms	Control sediment	18.0	2.5	0.42 ns	1.20 ns
	Reference sediment	17.8	1.7		
	Dredged material H	17.0	5.0		
	Dredged material I	18.8	1.7		
	Dredged material J	17.0	1.0		
Total (combined)	Control sediment	57.6	4.3	0.37 ns	1.73 ns
	Reference sediment	55.8	5.7		
	Dredged material H	54.8	10.7		
	Dredged material I	57.6	3.3		
	Dredged material J	54.8	4.7		

[a] The value for $C_{(cal)}$ is compared to $C_{(tab)}$, which equals 0.54 for 0.05 probability level, k = 5, and v = 4. Variances are considered to be homogeneous (ns) if $C_{(cal)} \leq C_{(tab)}$. Otherwise, variances are considered to be heterogeneous (*).

[b] The value for $F_{(cal)}$ is compared to $F_{(tab)}$, which equals 2.87 for 0.05 probability level, numerator df = 4, and denominator df = 20. Mean survivals are considered to be nonsignificantly different (ns) if $F_{(cal)} \leq F_{(tab)}$. Otherwise, the difference is considered to be significant (*).

3.2 Bioaccumulation Tests

Results of bioaccumulation tests with tissues of organisms that survived the 10-day exposure to control sediment, reference sediment, and the solid phase of dredged material are presented in Table 4 (grass shrimp), Table 5 (hard clams), and Table 6 (sandworms). Statistical analysis of data sets in which mean concentration of a chemical constituent in tissues of organisms exposed to any sample of dredged material was higher than mean concentration in reference organisms are presented in Table 7 (statistical analysis of reference and treatment data) and Table 8 (statistical analysis of control, reference, and treatment data). None of the 45 bioaccumulation tests (five types of chemical constituents x three test species x three samples of dredged material) identified chemical body burdens in tissues of organisms exposed to dredged material that were significantly greater (in a statistical sense) than body burdens observed in comparable reference organisms.

Table 4. Concentration of mercury (Hg), cadmium (Cd), PCBs, DDT, and aromatic hydrocarbons in tissues of grass shrimp (<u>Palaemonetes pugio</u>) that survived 10-day exposure to the solid phase of dredged material, control sediment, and reference sediment

		Concentration of chemical constituent in tissues (µg/g, wet weight)[a]				
Chemical	Replicate	Control	Reference sediment	Dredged material sample H	Dredged material sample I	Dredged material sample J
Mercury	1	0.024	0.056	0.050	0.074	0.062
	2	0.053	0.061	0.071	0.044	0.220
	3	0.021	0.026	0.059	0.063	0.220
	4	0.040	0.032	0.065	0.068	0.086
	5	0.048	0.084	0.069	0.056	0.064
	Mean	0.037	0.052	0.063	0.061	0.130
Cadmium	1	0.049	0.039	0.046	0.050	0.025
	2	0.047	0.033	0.030	0.028	0.033
	3	0.060	0.025	0.031	0.041	0.096
	4	0.077	0.056	0.070	0.034	0.040
	5	0.074	0.039	0.561	0.043	0.020
	Mean	0.061	0.038	0.148	0.039	0.043
PCBs	1	<0.01	<0.01	<0.01	<0.01	<0.01
	2	<0.01	<0.01	<0.01	<0.01	<0.01
	3	<0.01	<0.01	<0.01	<0.01	<0.01
	4	<0.01	<0.01	<0.01	<0.01	<0.01
	5	<0.01	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	<0.01	<0.01	<0.01	<0.01
DDT	1	<0.01	<0.01	<0.01	<0.01	<0.01
	2	<0.01	<0.01	<0.01	<0.01	<0.01
	3	<0.01	<0.01	<0.01	<0.01	<0.01
	4	<0.01	<0.01	<0.01	<0.01	<0.01
	5	<0.01	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatic hydrocarbons	1	<0.10	<0.10	<0.10	<0.10	<0.10
	2	<0.10	<0.10	<0.10	<0.10	<0.10
	3	<0.10	<0.10	<0.10	<0.10	<0.10
	4	<0.10	0.30	<0.10	<0.10	<0.10
	5	<0.10	<0.10	<0.10	<0.10	<0.10
	Mean	<0.10	0.14	<0.10	<0.10	<0.10

[a]Data sets in which mean tissue concentration in organisms exposed to any sample of dredged material is higher than mean concentration in reference organisms are enclosed by boxes. Statistical analyses of the enclosed data sets appear in Tables 7 and 8.

Table 5. Concentration of mercury (Hg), cadmium (Cd), PCBs, DDT, and aromatic hydrocarbons in tissues of hard clams (<u>Mercenaria mercenaria</u>) that survived 10-day exposure to the solid phase of dredged material, control sediment, and reference sediment

		Concentration of chemical constituent in tissues (μg/g, wet weight)[a]				
Chemical	Replicate	Control	Reference sediment	Dredged material sample H	Dredged material sample I	Dredged material sample J
Mercury	1	0.014	0.027	0.020	0.015	0.022
	2	0.026	0.026	0.017	0.022	0.024
	3	0.024	0.029	0.018	0.015	0.024
	4	0.027	0.026	0.020	0.018	0.028
	5	0.019	0.023	0.016	0.021	0.016
	Mean	0.022	0.026	0.018	0.018	0.023
Cadmium	1	0.12	0.19	0.17	0.12	0.19
	2	0.24	0.25	0.18	0.25	0.25
	3	0.27	0.29	0.15	0.14	0.25
	4	0.29	0.27	0.16	0.23	0.35
	5	0.26	0.28	0.15	0.18	0.16
	Mean	0.24	0.26	0.16	0.18	0.24
PCBs	1	<0.01	<0.01	<0.01	<0.01	<0.01
	2	<0.01	<0.01	<0.01	<0.01	<0.01
	3	<0.01	<0.01	<0.01	<0.01	<0.01
	4	<0.01	<0.01	<0.01	<0.01	<0.01
	5	<0.01	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	<0.01	<0.01	<0.01	<0.01
DDT	1	<0.01	<0.01	<0.01	<0.01	<0.01
	2	<0.01	<0.01	<0.01	<0.01	<0.01
	3	<0.01	<0.01	<0.01	<0.01	<0.01
	4	<0.01	<0.01	<0.01	<0.01	<0.01
	5	<0.01	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatic hydrocarbons	1	<0.10	<0.10	<0.10	<0.10	<0.1
	2	<0.10	<0.10	<0.10	<0.10	<0.1
	3	<0.10	<0.10	<0.10	<0.10	<0.1
	4	<0.10	<0.10	<0.10	<0.10	<0.1
	5	<0.10	<0.10	<0.10	0.33	<0.1
	Mean	<0.10	<0.10	<0.10	0.15	<0.1

[a]Data sets in which mean tissue concentration in organisms exposed to any sample of dredged material is higher than mean concentration in reference organisms are enclosed by boxes. Statistical analyses of the enclosed data sets appear in Tables 7 and 8.

Table 6. Concentration of mercury (Hg), cadmium (Cd), PCBs, DDT, and aromatic hydrocarbons in tissues of sandworms (Nereis virens) that survived 10-day exposure to the solid phase of dredged material, control sediment, and reference sediment

		Concentration of chemical constituent in tissues (µg/g, wet weight)[a]				
Chemical	Repli-cate	Control	Reference sediment	Dredged material sample H	Dredged material sample I	Dredged material sample J
Mercury	1	0.007	<0.005	<0.006	0.006	0.012
	2	0.006	<0.005	0.008	0.011	0.008
	3	<0.005	0.017	0.008[b]	<0.004	0.008
	4	<0.005	<0.004	<0.006	<0.005	0.005
	5	0.010	0.007	0.008	0.005	0.005
	Mean	0.007	0.008	0.008	0.006	0.008
Cadmium	1	0.16	0.14	0.079	0.14	0.21
	2	0.099	0.13	0.11	0.094	0.15
	3	0.16	0.093	0.17[b]	0.086	0.16
	4	0.14	0.13	0.17[b]	0.18	0.11
	5	0.14	0.15	0.31	0.13	0.12
	Mean	0.14	0.13	0.17	0.13	0.15
PCBs	1	<0.01	<0.01	<0.01	<0.01	<0.01
	2	<0.01	<0.01	<0.01	<0.01	<0.01
	3	<0.01	<0.01	<0.01	<0.01	<0.01
	4	<0.01	<0.01	<0.01	<0.01	<0.01
	5	<0.01	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	<0.01	<0.01	<0.01	<0.01
DDT	1	<0.01	<0.01	<0.01	<0.01	<0.01
	2	<0.01	<0.01	<0.01	<0.01	<0.01
	3	<0.01	<0.01	<0.01	<0.01	<0.01
	4	<0.01	<0.01	<0.01	<0.01	<0.01
	5	<0.01	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatic hydrocarbons	1	<0.10	<0.10	<0.10	<0.10	<0.01
	2	<0.10	<0.10	<0.10	<0.10	<0.01
	3	<0.10	<0.10	<0.10	<0.10	<0.01
	4	<0.10	<0.10	<0.10	<0.10	<0.01
	5	<0.10	<0.10	<0.10	<0.10	<0.01
	Mean	<0.10	<0.10	<0.10	<0.10	<0.01

[a]Data sets in which mean tissue concentration in organisms exposed to any sample of dredged material is higher than mean concentration in reference organisms are enclosed by boxes. Statistical analyses of the enclosed data sets appear in Tables 7 and 8.

[b]Due to worm mortality during solid phase bioassay, no sample was available for analysis. Recorded value is the mean of the other samples in this data set.

Table 7. Statistical analyses of selected data in bioaccumulation study (without control data) -- data sets in which mean tissue concentration in organisms exposed to any sample of dredged material is higher than mean concentration in reference organisms

		Cochran's test for homogeneity of variances of chemical data				*Nonparametric one-way analysis of variance (ANOVA) of chemical data (Kruskal and Wallis' test)*
Organism	Chemical constituent	Treatment	Mean	Variance	$C_{(cal)}$[a]	$\chi^2_{(cal)}$[b]
Grass shrimp	Mercury	Reference sediment	0.052	0.00055		
		Dredged material H	0.063	0.00007	0.90 *	6.7 ns
		Dredged material I	0.061	0.00013		
		Dredged material J	0.130	0.00678		
Grass shrimp	Cadmium	Reference sediment	0.038	0.00013	0.98 *	2.5 ns
		Dredged material H	0.148	0.05367		
		Dredged material I	0.039	0.00007		
		Dredged material J	0.043	0.00094		
Hard clams	Aromatic hydro-carbons	Reference sediment	<0.10	0.000	1.00 *	1.4 ns
		Dredged material H	<0.10	0.000		
		Dredged material I	0.15	0.0036		
		Dredged material J	<0.10	0.000		
Sandworms	Cadmium	Reference sediment	0.13	0.00046	0.69 *	2.2 ns
		Dredged material H	0.17	0.00786		
		Dredged material I	0.13	0.00144		
		Dredged material J	0.15	0.00155		

[a]The value for $C_{(cal)}$ is compared to $C_{(tab)}$, which equals 0.63 for 0.05 probability level, k = 4, and v = 4. Variances are considered to be homogeneous (ns) if $C_{(cal)} \leq C_{(tab)}$. Otherwise, variances are considered to be heterogeneous (*).

[b]The value for $\chi^2_{(cal)}$ is compared to $\chi^2_{(tab)}$, which equals 7.81 for 0.05 probability level, df = 3. Means are considered to be nonsignificantly different (ns) if $\chi^2_{(cal)} \leq \chi^2_{(tab)}$. Otherwise, the difference is considered to be significant (*).

Table 8. Statistical analyses of selected data in bioaccumulation study (with control data) -- data sets in which mean tissue concentration in organisms exposed to any sample of dredged material is higher than mean concentration in reference organisms

Organism	Chemical constituent	Cochran's test for homogeneity of variances of chemical data: Treatment	Mean	Variance	$C_{(cal)}$[a]	Nonparametric one-way analysis of variance (ANOVA) of chemical data (Kruskal and Wallis' test): $X^2_{(cal)}$[b]	Wilcoxon-Mann-Whitney's STP test for identifying cause of significant difference in chemical data, $U_{(cal)}$[c]: Control vs. treatment	Reference vs. treatment
Grass shrimp	Mercury	Control sediment	0.037	0.00020	0.88 *	10.1 *		
		Reference sediment	0.052	0.00055				
		Dredged material H	0.063	0.00007			24.0 ns	17.0 ns
		Dredged material I	0.061	0.00013			23.0 ns	16.5 ns
		Dredged material J	0.130	0.00678			25.0 *	23.0 ns
Grass shrimp	Cadmium	Control sediment	0.061	0.00019	0.98 *	4.3 ns		
		Reference sediment	0.038	0.00013				
		Dredged material H	0.148	0.05367				
		Dredged material I	0.039	0.00007				
		Dredged material J	0.043	0.00094				
Hard clams	Aromatic hydrocarbons	Control sediment	<0.10	0.000	1.00 *	0.6 ns		
		Reference sediment	<0.10	0.000				
		Dredged material H	<0.10	0.000				
		Dredged material I	0.15	0.036				
		Dredged material J	<0.10	0.000				
Sandworms	Cadmium	Control sediment	0.14	0.00062	0.66 *	0.0 ns		
		Reference sediment	0.13	0.00046				
		Dredged material H	0.17	0.00786				
		Dredged material I	0.13	0.00144				
		Dredged material J	0.15	0.00155				

[a]The value for $C_{(cal)}$ is compared to $C_{(tab)}$, which equals 0.54 for 0.05 probability level, k = 5, and v = 4. Variances are considered to be homogeneous (ns) if $C_{(cal)} \leq C_{(tab)}$. Otherwise, variances are considered to be heterogeneous (*).

4. LITERATURE CITED

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APPENDIX A

MAPS OF DREDGING AND DISPOSAL SITES

This appendix contains two maps that were supplied to the laboratory by the New England Division of the Corps of Engineers. The first map (Figure A.1) identifies the sampling stations in the vicinity of the JFK Library in Boston, Massachusetts from which proposed dredged material was collected by the New England Division and by ENSECO. Three samples of material were biologically tested -- samples collected from stations H through J. The second map (Figure A.2) identifies the location (marked by a solid triangle) from which the Division and ENSECO obtained reference (disposal-site) sediment.

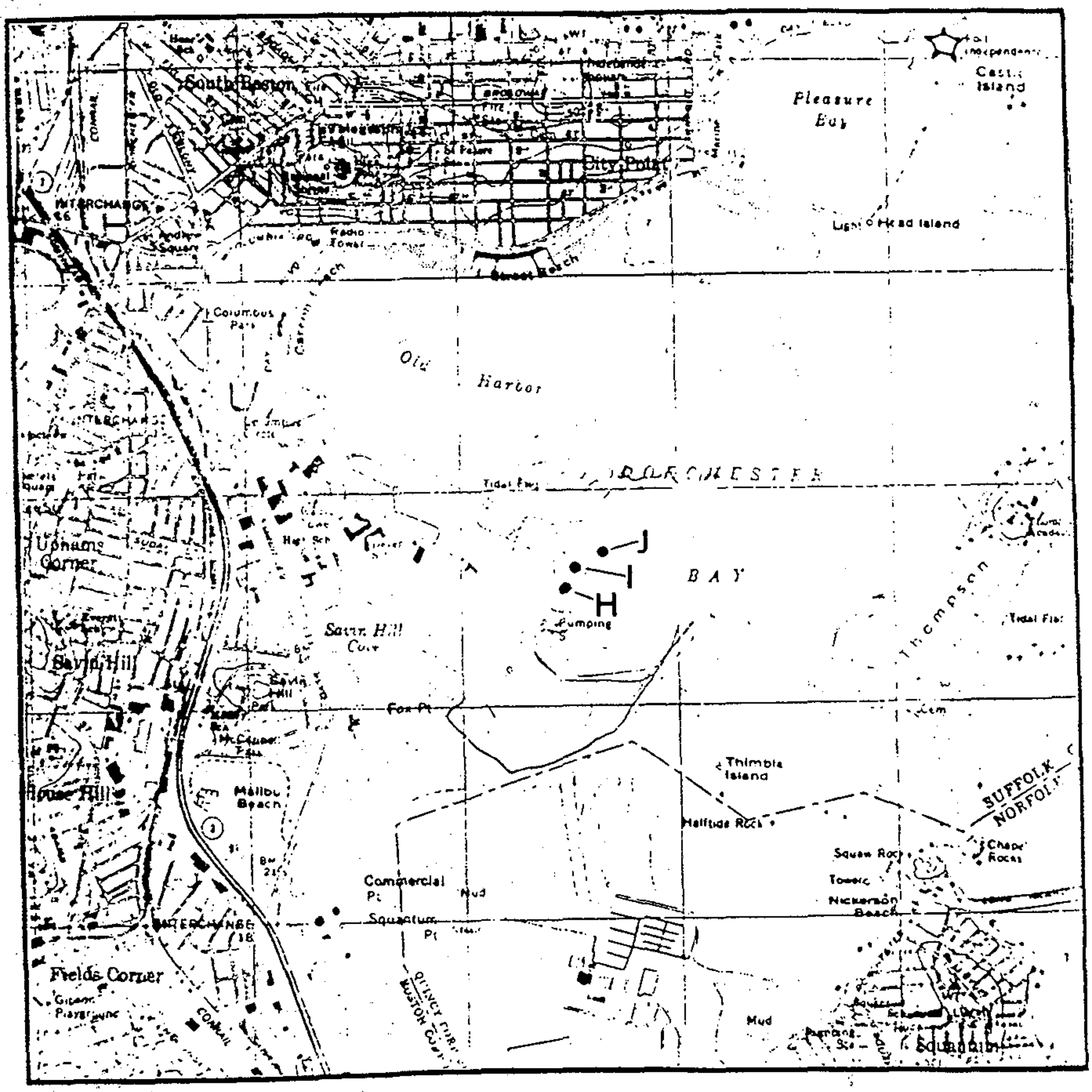
South Boston
City Point
Pleasure Bay
Castle Island
Head Island
Old Harbor
DORCHESTER
BAY
J
I
H
Pumping
Upham's Corner
Savin Hill
Fields Corner
Thompson
Thimble Island
Halftide Rock
Squaw Rock
Chapel Rocks
Nickerson Beach
Commercial Pt
Squantum Pt
Fox Pt
Malibu Beach
INTERCHANGE 16
INTERCHANGE 18
SUFFOLK
NORFOLK
Mud
Tidal Flat
Columbus Park
Squantum

Figure A.1.

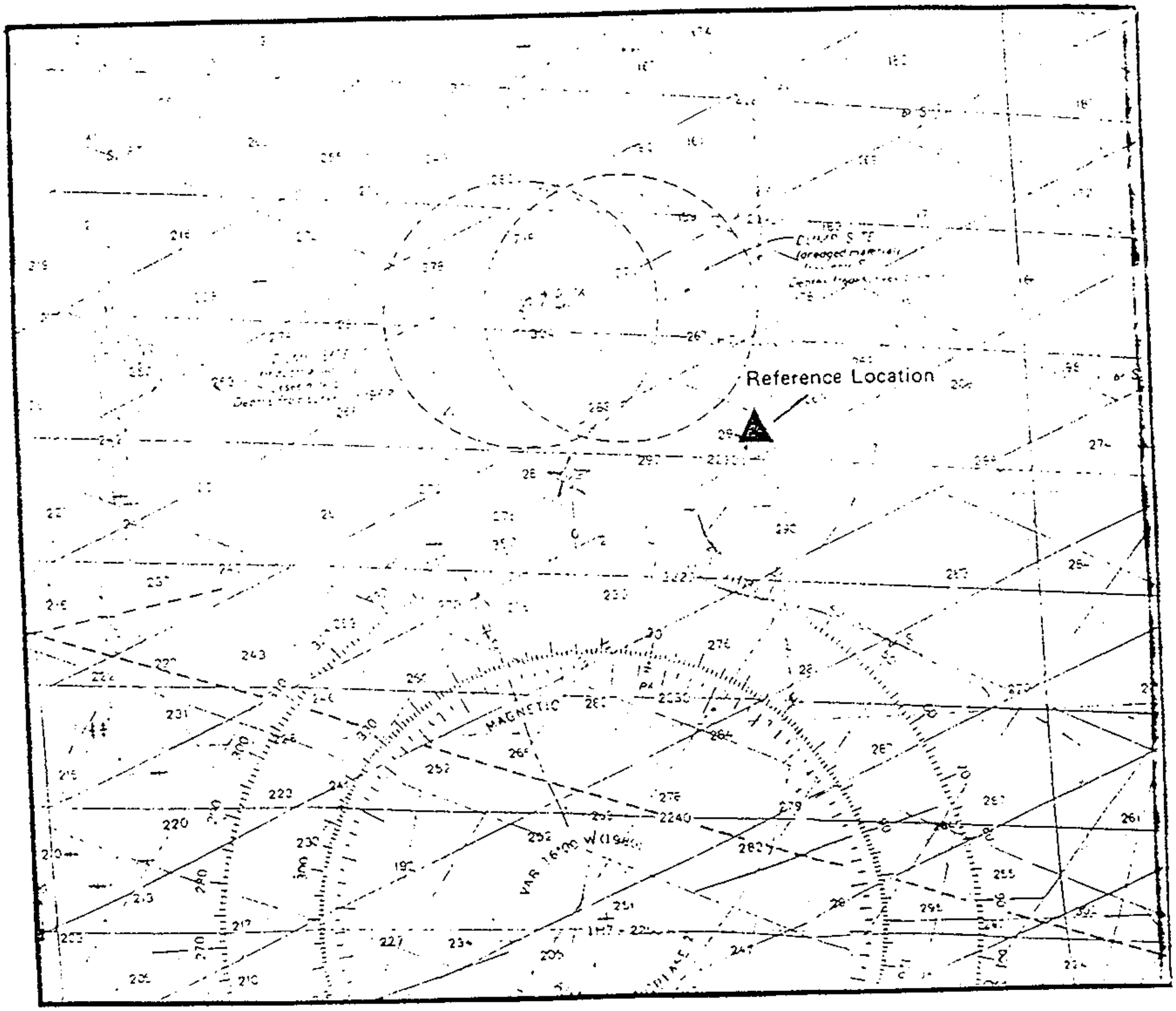

Figure A.2.

APPENDIX B

RAW TOXICITY-RELATED DATA

This appendix contains raw toxicity-related data generated by solid phase bioassays with sandworms.

Table B.1. Results of solid phase bioassays with grass shrimp (<u>Palaemonetes pugio</u>), hard clams (<u>Mercenaria mercenaria</u>), and sandworms (<u>Nereis virens</u>)[a]

	Number of survivors[b,c]											
Treatment (t):	Control (culture) sediment				Reference (disposal-site) sediment				Dredged material sample H			
Replicate (r):	Grass shrimp	Hard clams	Sand-worms	Total	Grass shrimp	Hard clams	Sand-worms	Total	Grass shrimp	Hard clams	Sand-worms	Total
1	19	20	17	56	20	19	20	59	16	20	18	54
2	20	20	18	58	16	20	17	53	19	20	16	55
3	19	20	16	55	19	20	17	56	16	20	14	50
4	20	20	20	60	19	20	18	57	19	20	17	56
5	20	20	19	59	17	20	17	54	19	20	20	59
Mean ($\bar{x}$)	19.6	20.0	18.0	57.6	18.2	19.8	17.8	55.8	17.8	20.0	17.0	54.8
____ (%)	(98.0)	(100.0)	(90.0)	(96.0)	(91.0)	(99.0)	(89.0)	(93.0)	(89.0)	(100.0)	(85.0)	(91.3)

[a]Bioassays (10-day tests) were conducted at 20 ± 2°C in 38-liter aquaria. Organisms were exposed to each replicate of a treatment in a single aquarium. Water in aquaria was exchanged by the flow-through method and was aerated. A 14-hr light and 10-hr dark photoperiod was maintained with cool-white fluorescent bulbs. Salinity was maintained at 28 ppt.

[b]Twenty (20) individuals were initially exposed to each replicate of a treatment. Thus, a total of 60 animals was employed in each aquarium.

[c]In addition to monitoring survival of all species, burrowing behavior of sandworms was noted daily. No differences were observed among aquaria.

Table B.1. Continued.

Treatment (t):	Number of survivors [b,c] Dredged material sample I				Dredged material sample J			
Replicate (r):	Grass shrimp	Hard clams	Sand-worms	Total	Grass shrimp	Hard clams	Sand-worms	Total
1	19	20	19	58	20	20	17	57
2	20	20	17	57	18	20	18	56
3	18	20	20	58	16	20	16	52
4	17	20	18	55	18	20	18	56
5	20	20	20	60	17	20	16	53
Mean ($\bar{x}$)	18.8	20.0	18.8	57.6	17.8	20.0	17.0	54.8
(%)	(94.0)	(100.0)	(94.0)	(96.0)	(89.0)	(100.0)	(85.0)	(91.3)

Table B.1 Continued - pH measured during solid phase bioassay.

Treatment	Replicate (r)	Day of Exposure 0	1	2	3	4	5	6	7	8	9	10
Control (culture) sediment	1	7.9	7.9	7.2	7.8	7.7	7.7	7.8	7.8	7.8	7.9	7.8
	2	8.0	8.0	7.5	7.6	7.7	7.7	7.9	7.8	7.8	7.8	7.8
	3	8.0	8.0	7.8	7.7	7.8	7.7	7.9	7.8	7.8	7.9	7.7
	4	7.9	7.9	7.2	7.7	7.7	7.7	7.8	7.8	7.8	7.8	7.7
	5	7.9	7.8	7.2	7.7	7.6	7.7	7.8	7.7	7.7	7.8	7.8
Reference (disposal-site) sediment	1	7.9	7.9	7.5	7.7	7.8	7.7	7.8	7.8	7.8	7.8	7.7
	2	8.0	8.0	7.8	7.7	7.7	7.7	7.7	7.8	7.8	7.8	7.7
	3	8.0	7.9	7.1	7.7	7.6	7.7	7.9	7.8	7.8	7.8	7.7
	4	7.9	8.0	7.7	7.7	7.7	7.7	7.9	7.8	7.8	7.8	7.7
	5	7.9	8.0	7.3	7.7	7.6	7.8	7.8	7.7	7.7	7.7	7.8
Dredged material sample H	1	7.9	7.9	7.1	7.6	7.7	7.7	7.8	7.8	7.8	7.8	7.7
	2	7.9	7.9	7.3	7.7	7.7	7.7	7.8	7.8	7.8	7.8	7.8
	3	8.0	7.9	7.2	7.7	7.7	7.8	7.7	7.8	7.7	7.8	7.6
	4	7.9	7.9	7.2	7.7	7.7	7.8	7.7	7.8	7.8	7.8	7.8
	5	8.0	7.9	7.2	7.7	7.6	7.8	7.8	7.7	7.8	7.8	7.8
Dredged material sample I	1	7.9	8.0	7.5	7.7	7.7	7.7	7.7	7.7	7.8	7.8	7.7
	2	7.9	8.0	7.5	7.7	7.8	7.8	7.7	7.8	7.8	7.8	7.7
	3	8.1	8.0	7.8	7.7	7.9	7.8	7.7	7.9	7.9	7.9	7.8
	4	7.9	7.9	7.5	7.6	7.6	7.7	7.8	7.7	7.8	7.7	7.7
	5	7.9	7.9	7.3	7.7	7.7	7.7	7.9	7.7	7.8	7.8	7.8
Dredged material sample J	1	8.0	8.0	7.8	7.7	7.8	7.7	7.8	7.8	7.9	7.9	7.8
	2	8.0	7.9	7.2	7.7	7.7	7.7	7.8	7.8	7.8	7.8	7.7
	3	7.9	8.0	7.5	7.7	7.7	7.8	7.8	7.8	7.8	7.8	7.8
	4	7.9	8.0	7.5	7.7	7.7	7.8	7.7	7.8	7.8	7.8	7.7
	5	7.9	8.0	7.3	7.7	7.7	7.7	7.7	7.8	7.8	7.8	7.8

Table B.1 Continued - Dissolved oxygen concentrations measured during solid phase bioassay.

Treatment	Replicate (r)	Day of Exposure 0	1	2	3	4	5	6	7	8	9	10
Control (culture) sediment	1	8.1	7.5	7.2	7.5	7.4	8.0	7.7	7.4	7.5	7.5	7.5
	2	8.0	6.9	7.4	7.5	7.6	7.8	7.6	7.5	7.6	7.5	7.3
	3	7.9	7.4	7.2	7.5	7.2	7.8	7.6	7.3	7.4	7.4	7.1
	4	7.9	7.2	7.1	7.5	7.4	7.8	7.7	7.5	7.5	7.6	7.4
	5	8.1	7.1	7.1	7.5	7.5	7.7	7.5	7.5	7.7	7.5	7.3
Reference (disposal-site) sediment	1	8.0	6.8	6.8	7.5	7.4	7.7	7.6	7.3	7.3	7.4	7.2
	2	7.9	7.0	7.1	7.3	7.1	7.7	7.8	7.3	7.3	7.4	7.2
	3	8.0	7.3	7.1	7.5	7.4	7.5	7.8	7.5	7.6	7.4	7.3
	4	7.9	7.0	7.2	7.5	7.3	7.4	7.4	7.4	7.3	7.3	7.6
	5	7.8	7.1	7.1	7.6	7.6	7.7	7.5	7.5	7.6	7.0	7.5
Dredged material sample H	1	8.1	6.8	7.1	7.4	7.5	7.5	7.4	7.5	7.6	7.0	7.4
	2	8.0	6.7	7.1	7.4	7.3	7.6	7.8	7.5	7.6	7.5	7.3
	3	8.0	7.1	6.9	7.5	7.3	7.7	7.7	7.5	7.6	7.1	7.4
	4	8.1	6.9	7.0	7.3	7.4	7.7	7.8	7.6	7.6	7.0	7.2
	5	8.0	7.4	7.1	7.3	7.3	7.8	7.5	7.5	7.6	7.5	7.4
Dredged material sample I	1	8.1	7.4	7.1	7.4	7.3	7.7	7.3	7.5	7.6	7.5	7.4
	2	8.0	7.2	7.1	7.6	7.4	7.6	7.3	7.2	7.3	7.1	7.3
	3	8.1	7.4	7.4	7.4	7.3	7.7	7.5	7.5	7.6	7.3	7.7
	4	8.1	6.4	7.0	7.6	7.3	7.6	7.5	7.4	7.5	7.4	7.3
	5	8.1	6.9	6.5	7.4	7.5	7.8	7.6	7.6	7.6	7.5	7.3
Dredged material sample J	1	7.9	7.3	7.3	7.4	7.3	7.8	7.5	7.5	7.6	7.3	7.7
	2	8.1	7.2	7.1	7.5	7.3	7.7	7.3	7.5	7.6	7.3	7.4
	3	8.0	7.3	7.4	7.5	7.6	7.7	7.7	7.6	7.6	7.5	7.3
	4	8.0	7.5	7.0	7.5	7.6	7.7	7.5	7.4	7.3	7.4	7.1
	5	8.1	7.2	7.1	7.4	7.3	7.7	7.5	7.6	7.6	7.0	7.3

APPENDIX C

QUALITY CONTROL PROCEDURES

This appendix addresses quality-control procedures identified in the general Statement of Work for toxicity tests conducted for the New England Division of the Corps of Engineers.

QUALITY-CONTROL RESPONSE	QUALITY-CONTROL REQUIREMENT
1. Testing with sediment shall commence no later than 12 calendar days from date of sample collection.	Sediment was delivered to ERCO on June 11 and November 23, 1986. Processing of sediment commenced on June 13 and December 3. Consequently, 2-8 days elapsed between delivery of the sample and sample processing.
2. Mortality of control organisms during toxicity tests can be no greater than 10%.	Total (combined) mortality of control organisms was 4.0.
3. Detection limits for chemical constituents in bioaccumulation tests must be: Cd--0.25 ppm; Hg--0.20 ppm; PCBs--0.04 ppm; DDT family--0.20 ppm; and aromatic hydrocarbons--0.10 ppm.	Detection limits were: Cd--as low as 0.020 ppm; Hg--as low as 0.004 ppm; PCBs--0.01 ppm; DDT family--0.01 ppm; and aromatic hydrocarbons--0.10 ppm.

QUALITY-CONTROL RESPONSE	QUALITY-CONTROL REQUIREMENT
4. Sensitivity of chemical measurements in bioaccumulation tests must be: Cd--0.10 ppm; Hg--0.10 ppm; PCBs--0.01 ppm; DDT family--0.10 ppm; and aromatic hydrocarbons--0.05 ppm.	Sensitivity of chemical measurements was Cd--as much as 0.001 ppm; Hg--as much as 0.001 ppm; PCBs--0.01 ppm; DDT family--0.01 ppm; and aromatic hydrocarbons--as much as 0.01 ppm.

An additional quality-control recommendation (New York District COE, 1982), is that concentrations of chemical constituents in stock (pretest) organisms employed in bioaccumulation tests should be less than the previously identified required detection limits for the constituents (except that pretest levels of hydrocarbons should be less than 0.15 ppm). The following comparisons address that issue.

Chemical constituent	Detection limit (ppm)	Mean concentration in stock (pretest) organisms (ppm)		
		Grass shrimp	Hard clams	Sandworms
Cd	0.25	0.05	0.13	0.12
Hg	0.20	0.020	0.016	0.007
PCBs	0.04	<0.01	<0.01	<0.01
DDT family	0.20	<0.01	<0.01	<0.01
Aromatic hydrocarbons	0.15	<0.10	<0.10	<0.10

NAVIGATION IMPROVEMENT REPORT

JOHN F. KENNEDY LIBRARY PIER
COLUMBIA POINT
DORCHESTER, MASSACHUSETTS

SECTION B

ENGINEERING INVESTIGATIONS
DESIGN, AND COST ESTIMATES

PREPARED BY:
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FOR:
NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

SECTION B

ENGINEERING DESIGN AND COST ESTIMATES

This Section is composed of two parts. Part 1 contains the engineering design and cost estimates for the proposed Pier, Dolphins, Catwalk and Floats and includes appendicies containing design caculations and the geotechnical report on the subsurface exploration program. Part 2 contains the engineering design and cost estimates for access channel and turning-mooring basin dredging.

NAVIGATION IMPROVEMENT REPORT

JOHN F. KENNEDY LIBRARY PIER

SECTION B - PART 1

PIER DESIGN

AND COST ESTIMATES

PRELIMINARY DESIGN REPORT
DOCK FACILITY
AT
JOHN F. KENNEDY LIBRARY

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PRELIMINARY DESIGN REPORT
DOCK FACILITY
AT
JOHN F. KENNEDY LIBRARY
COLUMBIA POINT
DORCHESTER, MASSACHUSETTS

1. PURPOSE. The purpose of this preliminary design report is to present the site layout, structural and geotechnical engineering considerations, and construction cost estimate for the proposed dock facility at the John F. Kennedy Library, Dorchester, Massachusetts. This report is prepared for a submission to the National Archives and Record Administration in partial fulfillment of New England Division's requirements as set forth in the Memorandum of Understanding dated October 3, 1985.

2. SCOPE. The scope of work is to provide the National Archives and Record Administration with an engineering report which will be used to evaluate the magnitude and cost of the proposed dock facility. As discussed later, the users and vessels to be accommodated at this facility are tentative at this time. In this light, the designs presented in this report are considered preliminary and are to be refined when functional requirements are better defined. It is intended that this report provide the necessary data to serve as a basis for final design.

Related work on surveys, dredging, and environmental assessments is being done by other elements within the New England Division. A detailed discussion of this work is not presented herein.

3. FUNCTIONAL REQUIREMENTS. This project was initiated by the National Archives and Record Administration to improve access to the Kennedy Library. The project consists of dredging an access channel and turning basin, and construction of a dock facility. At this time, it is envisioned that the function of the facility will be to provide the following: an active berthing area for a passenger ferry which would link all of Boston's major attractions; a mooring area for a proposed research vessel to be operated by the University of Massachusetts; and an active berthing area for recreational craft. The site layout and designs presented in this report are based on these requirements. The requirements of other prospective users of the facility, such as the Thompson Island Ferry and the South Shore Commuter Ferry, have not been addressed.

4. SITE LAYOUT

a. Background. In their letter dated May 22, 1986, the National Archives and Record Administration selected the general location and layout of the dock facility. Their basic scheme was as follows: an "L"-shaped dock located at the foot of the bay plaza stairs immediately to the north of the precast concrete wall; a floating stage sheltered in the interior corner of the dock; and an aluminum catwalk, cantilevered from pile dolphins, located to the south of the dock. New England Division's design has deviated slightly from this scheme for the reasons discussed below.

b. Deviations from National Archives and Record Administration's Scheme. New England Division has made three changes to the original scheme. First, the dock was moved to a location immediately to the south of the precast concrete wall at the bay plaza stairs as this location provides the following advantages: accessibility by light trucks which may be used to transport equipment to the University of Massachusetts research vessel; and a direct route from the dock to the side entrance to level 1 of the Library for handicapped passengers using the ferry. Second, the floating stage was relocated to the north of the dock as the old location was not compatible with the selected dredge limits and would require too steep a slope on the gangway from the stage to the dock. Third, a timber catwalk, offset toward the shore side of the pile dolphins and supported by independent timber piles, was selected. This change was made to separate the catwalk from the immediate area of boat traffic and to eliminate what would be a troublesome connection of the catwalk to the pile dolphins which undergo large deflections when impacted by vessels.

c. Proposed Layout. The proposed site layout for the dock facility is depicted on Plate 1. This layout includes an "L"-shaped dock with the long leg extending approximately 110 feet out from the shore and the short leg extending approximately 50 feet to the south. Located immediately to the south of precast concrete wall at the bay plaza stairs, the dock primarily will serve as a transfer point for passengers using the ferry with occasional use as a transfer point for crew and equipment of the research vessel. The dock will be 20 feet in width between curbs, have a deck at Elevation +17.0 feet Boston City Base, and have a 3.5-foot high railing for the safety of pedestrians and vehicles.

Five 14-pile dolphins, positioned parallel to the shoreline, will be located as follows: one on the north side of the dock and four to the south at 50-foot spacings. The three dolphins at the southern end of the facility will be used to moor the research vessel, while the two dolphins at the northern end will be used to berth the passenger ferry. The top elevation of the dolphins is tentatively set at +17.0 feet Boston City Base, but may have to be adjusted when the freeboard of the vessels is determined. One pile near the center of each dolphin will be left two feet above this elevation for mooring purposes.

Located north of the dock, a 12-foot by 20-foot floating stage will accommodate recreational craft. A 40-foot long by 3-foot wide gangway will connect the dock with the floating stage, which is located at a distance from the dock such that the slope of the gangway will be 2.5 horizontal to 1 vertical at low water. The stage will be partially protected by the northern most dolphin.

Extending to the south of the dock, a 117.5-foot long by 3.5-foot wide catwalk will afford access to the mooring area for the research vessel. The catwalk is provided solely for the convenience of the crew of the research vessel; equipment will be loaded on the research vessel at the dock.

d. Dredging. In order to link the proposed dock facility to the existing Dorchester Bay and Neponset River Channel, dredging of a 2100-foot long by 120-foot wide access channel and a 4.7-acre turning basin is required. Dredging will be to a depth of 10 feet below mean low water and the dredge limit will be established at at distance of 50 feet off the toe of the existing stone revetment at the Library.

5. PERTINENT DATA.

a. Datum Planes. All elevations shown on the plates contained in this report are referenced to the Boston City Base. For ease of conversion to other commonly used datum planes, the National Geodetic Vertical Datum (NGVD) and the Mean Low Water (MLW) Datum, the tide levels at the project site are listed below for each datum plane:

Tide Level	Elevation		
	Feet Boston City Base	Feet NGVD	Feet MLW Datum
Mean High Water	+10.55	+4.9	+9.5
Mean Sea Level	+5.85	+0.2	+4.8
Mean Low Water	+1.05	-4.6	0.0

b. Characteristics of Vessels. The characteristics of the vessels for which the facility is to be designed have not been defined completely at this time. Limited information concerning the passenger ferry was obtained from Bay State Cruises, Inc. The proposed University of Massachusetts (UMass) research vessel is to be procured at some unspecified future date; it is anticipated that the length of this vessel will be in the range of 60 to 120 feet. It is emphasized that all of the salient characteristics of the vessels should be defined prior to initiation of final design. The designs presented in this report are based on the following:

Passenger Ferry -
- Length = 85 feet
- Beam = 30 feet
- Displacement Tonnage = 500 long tons

Proposed UMass Research Vessel -
Length = 100 feet (assumed)
Beam = Unknown
Displacement Tonnage = Unknown

Recreational Craft -
Length = 25 feet (assumed)

6. DESCRIPTION OF STRUCTURES.

a. Dock. Two alternatives will be presented for the "L"-shaped dock: A timber dock, pressure treated with a Cromated Copper Arsenate preservative to protect the structure from the marine environment, is depicted on Plates 2 and 3; and a precast concrete dock, with white concrete members to match the color of the existing concrete features of the Library, is depicted on Plates 4 and 5. Both alternatives are pile supported platforms which allow water to flow underneath. With either alternative, the construction of the first pile bents extending out from the shore will require temporary removal of a portion of the stone revetment. At the interface of the dock with the revetment, the ornamental ballards and chain will be removed and replaced with a concrete apron.

b. Dolphins. Five dolphins, each consisting of 14 pressure-treated timber piles, will be constructed as shown on Plate 6. Galvanized bolts and wire rope will be used to secure the top of the piles to ensure that they act as a unit.

c. Floating Stage. The floating stage will be constructed with pressure treated timber with polystyrene used for the floatation units. Four single timber piles will be provided to secure the horizontal position of the dock. A rubber fender and mooring cleats will be provided on the stage (See Plate 6).

d. Gangway. The gangway will consist of two trusses, fabricated from galvanized steel tubes and angles, with a timber walkway. As shown on Plate 6, the gangway will have a hinged connection to the dock, and wheels will be provided at the lower end where the gangway contacts the floating stage.

e. Catwalk. The catwalk will be a pile supported walkway constructed with pressure-treated timber and piles. All details of the catwalk shown on Plate 3, except for the connection to the dock, are typical irrespective of which dock alternative (timber or precast concrete) is selected.

7. STRUCTURAL DESIGN.

a. Criteria and References. The structural design criteria adopted for this project are contained in the following documents:

(1) Piers and Wharves, NAVFAC Design Manual 25.1, November 1980, Department of the Navy

(2) Ferry Terminals and Small Craft Berthing Facilities, NAVFAC Design Manual 25.5, July 1981, Department of the Navy

(3) Standard Specifications for Highway Bridges, 13th Edition, 1983, American Association of State Highway and Transportation Officials (A.A.S.H.T.O.)

b. Vertical Loads. The vertical live loads for the various project features are as follows:

(1) Dock - 250 psf uniform load; or A.A.S.H.T.O. H-10 truck load with a 15 percent impact factor for design of slabs, beams, and pile caps (structural elements below pile caps not designed for impact) applied non-concurrently.

(2) Catwalk - 100 psf

(3) Gangway - 75 psf

(4) Floating Stage - 25 psf uniform load plus live load reaction of gangway.

c. Horizontal Loads. The dock and dolphins will be subjected to the following horizontal loads: impact forces resulting from the berthing of vessels and forces acting on moored vessels produced by wind and current. These horizontal loads have not been calculated for this preliminary design report because it involves an evaluation of several variables which have not been fully defined at this time. This calculation will be done during final design when more information is obtained on the vessels to be accommodated.

d. Seismic Forces. Earthquake forces have not been calculated for this preliminary design report. This analysis will be done during final design in accordance with A.A.S.H.T.O. criteria.

e. Design Calculations. Preliminary design calculations for the dock are presented in Appendix A. These calculations have been developed only to the extent necessary to determine the required size of the main structural members and piles. All other project features are conceptual designs without supporting calculations.

f. Pile Requirements for Dock. Based on preliminary design calculations, the design load for timber and concrete piles is 10 tons and 22 tons, respectively. As shown on Plate 2 for the timber dock alternative, batter piles will be provided on the outboard pile bents for lateral and longitudinal stability. Subject to verification during final design, no batter piles will be required on the outboard pile bents for the concrete dock alternative. For both alternatives, timber fender piles will be provided on the outboard side of the dock.

8. GEOTECHNICAL DESIGN. A limited subsurface exploration program consisting of two drive sample borings was performed to verify the types and extent of foundation soils at the location of the proposed dock. The locations of the borings are shown on Plate 1. A detailed description of the subsurface conditions encountered, including copies of the boring logs, and a geotechnical design report are contained in Appendix B.

9. ANCILLARY REQUIREMENTS. It may be desirable to incorporate certain ancillary items into the construction contract for the dock facility. This ancillary work is identified for further consideration, but no designs have been prepared for this report. The work is as follows:

a. Provide electrical service and lighting for dock.

b. Construct transit shelter (three-sided enclosure for ten persons) and ticket booth for passengers of ferry.

c. Install water supply and sewage disposal lines to service boats using dock.

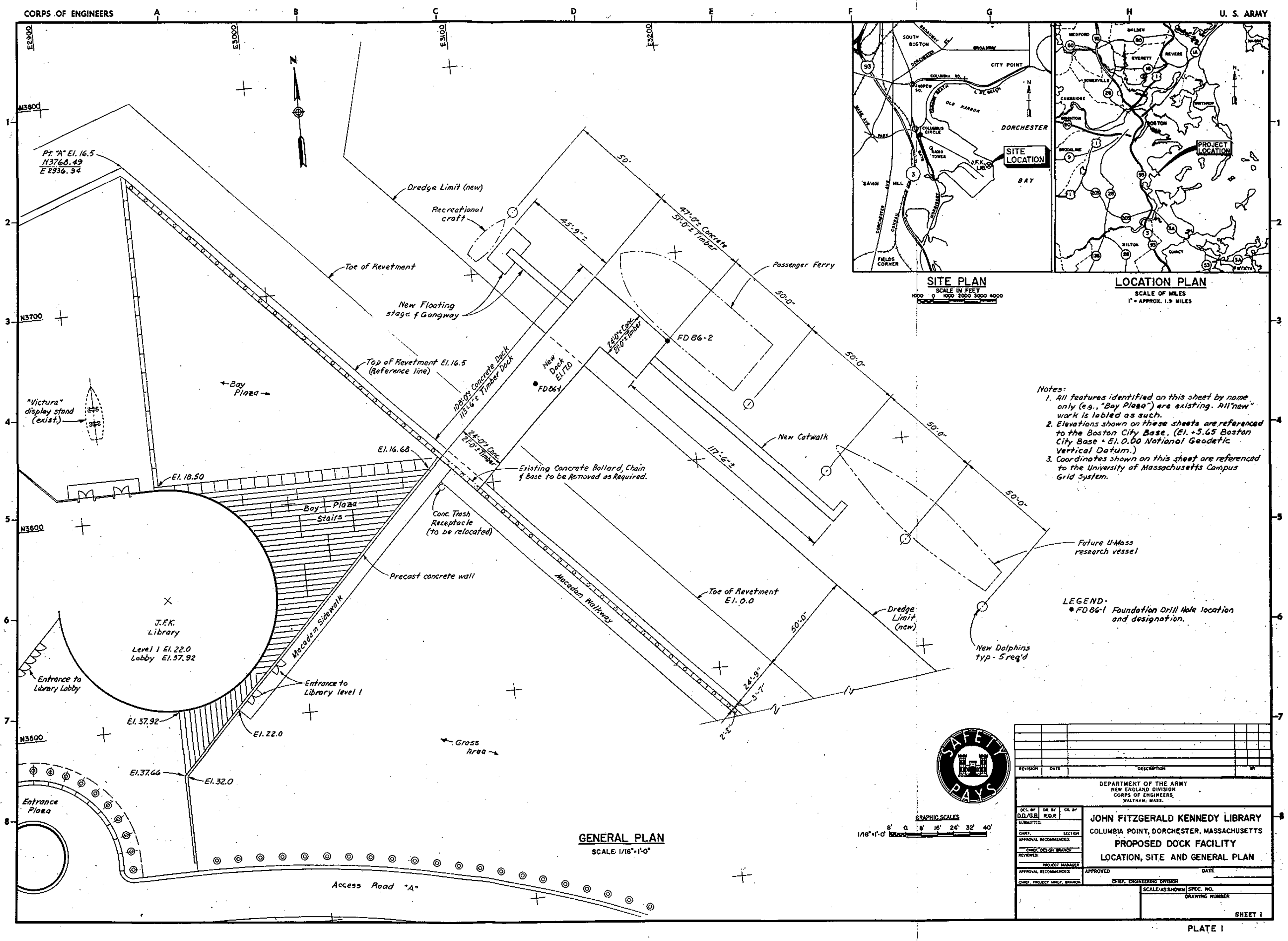
d. Provide telephone service to dock.

10. CONSTRUCTION SCHEDULE. The required sequence of construction for this project would be to complete all dredge work prior to commencing construction of the dock facility. Assuming that the dredge work is accomplished under separate contract, it is anticipated that the contract for construction of the dock facility would have a completion time of nine months. This estimate is based on an actual construction time of six months with an allowance of three months for delivery of materials and mobilization of equipment.

11. COST ESTIMATES. Construction costs referenced to September 1986 price levels are presented in Table 1. Separate estimates are prepared for the two alternatives, timber dock and precast concrete dock. Estimates for the dock, catwalk, dolphins, floating stage, and gangway are based on the preliminary designs presented herein with an allowance of 15 percent for contingency. Costs for the ancillary work discussed in paragraph 9 are budgetary estimates for which there is limited supporting data.

TABLE 1
CONSTRUCTION COST ESTIMATES
(September 1986 Price Level)

Item	Estimated Cost: Timber Dock	Estimated Cost: Precast Concrete Dock
Dock	$238,000	$197,000
Catwalk	45,000	45,000
Dolphins	64,000	64,000
Floating Stage	13,000	13,000
Gangway	12,000	12,000
	$372,000	$331,000
15% Contingency	56,000	50,000
	$428,000	$381,000
Electrical Service and Lighting	18,000	18,000
Transit Shelter and Ticket Booth	15,000	15,000
Water Supply and Sewage Disposal	16,000	16,000
Telephone Service	9,000	9,000
TOTAL	$486,000	$439,000


CORPS OF ENGINEERS
U. S. ARMY
Pt. "A" El. 16.5
N3768.49
E2936.94
Dredge Limit (new)
Recreational craft
Toe of Revetment
New Floating stage & Gangway
Top of Revetment El. 16.5 (Reference line)
108'0"± Concrete Dock
113'6"± Timber Dock
New Dock El. 17.0
FD86-1
FD86-2
47'0"± Concrete
51'0"± Timber
45'9"±
24'0"± Conc.
27'0"± Timber
Passenger Ferry
"Victura" display stand (exist.)
Bay Plaza
El. 16.68
El. 18.50
Bay Plaza Stairs
Existing Concrete Bollard, Chain & Base to be Removed as Required.
Conc. Trash Receptacle (to be relocated)
117'6"±
New Catwalk
50'0"
Future U-Mass research vessel
Precast concrete wall
Macadam Sidewalk
Macadam Walkway
Toe of Revetment El. 0.0
Dredge Limit (new)
New Dolphins typ - 5 req'd
J.F.K. Library
Level I El. 22.0
Lobby El. 37.92
Entrance to Library Lobby
Entrance to Library level I
El. 37.92
El. 22.0
El. 37.66
El. 32.0
Grass Area
Entrance Plaza
Access Road "A"
24'9"
3'-7"
2'-2"
GENERAL PLAN
SCALE 1/16"=1'-0"
GRAPHIC SCALES
1/16"=1'-0" 8' 0 8' 16' 24' 32' 40'
Notes:
1. All features identified on this sheet by name only (e.g., "Bay Plaza") are existing. All "new" work is labled as such.
2. Elevations shown on these sheets are referenced to the Boston City Base. (El. +5.65 Boston City Base = El. 0.00 National Geodetic Vertical Datum.)
3. Coordinates shown on this sheet are referenced to the University of Massachusetts Campus Grid System.
LEGEND-
• FD86-1 Foundation Drill Hole location and designation.
SOUTH BOSTON
CITY POINT
DORCHESTER
SITE LOCATION
BAY
SITE PLAN
SCALE IN FEET
1000 0 1000 2000 3000 4000
PROJECT LOCATION
LOCATION PLAN
SCALE OF MILES
1" = APPROX. 1.9 MILES
SAFETY PAYS
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
JOHN FITZGERALD KENNEDY LIBRARY
COLUMBIA POINT, DORCHESTER, MASSACHUSETTS
PROPOSED DOCK FACILITY
LOCATION, SITE AND GENERAL PLAN
SHEET 1
PLATE 1

CORPS OF ENGINEERS U. S. ARMY

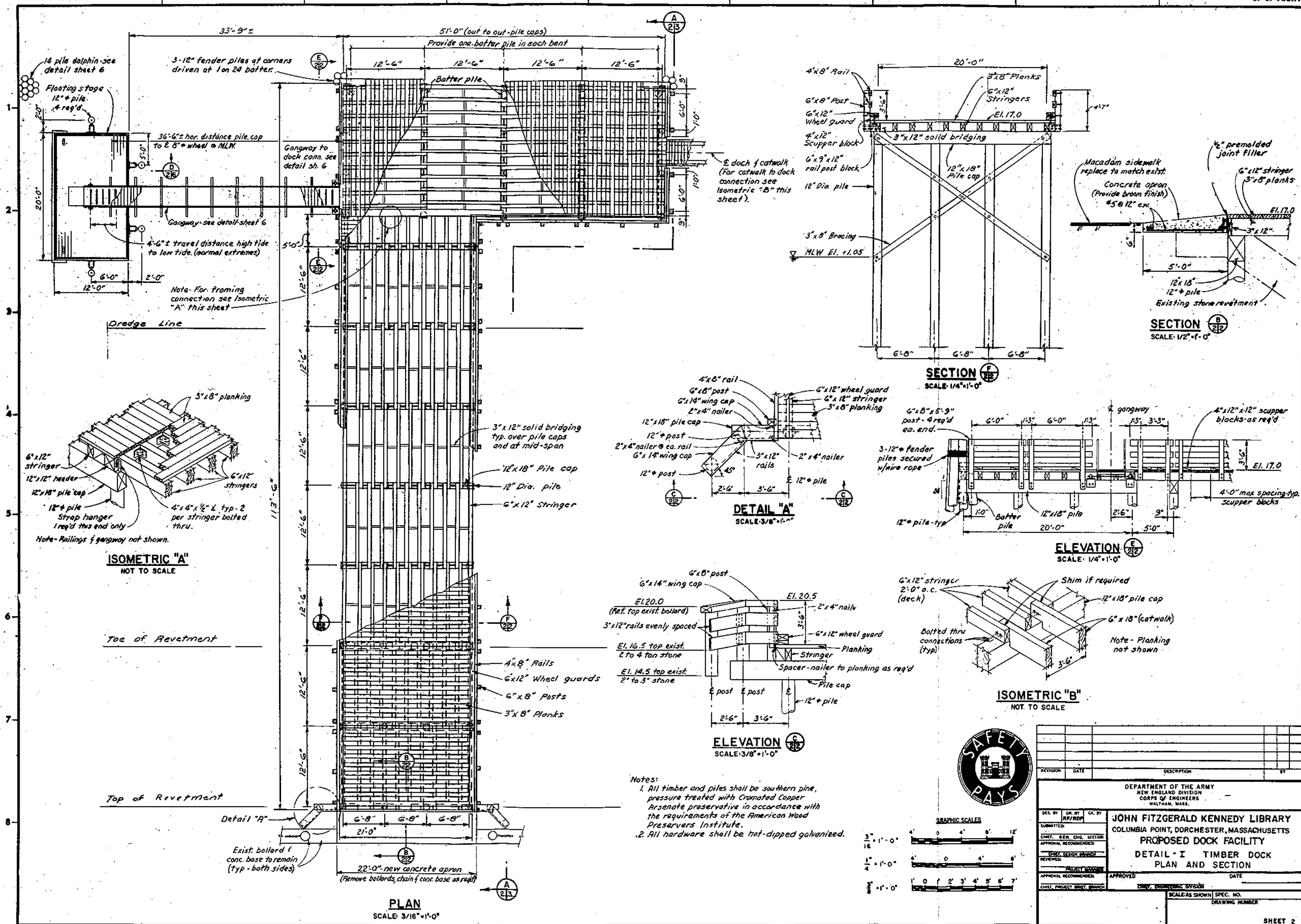


PLATE 2

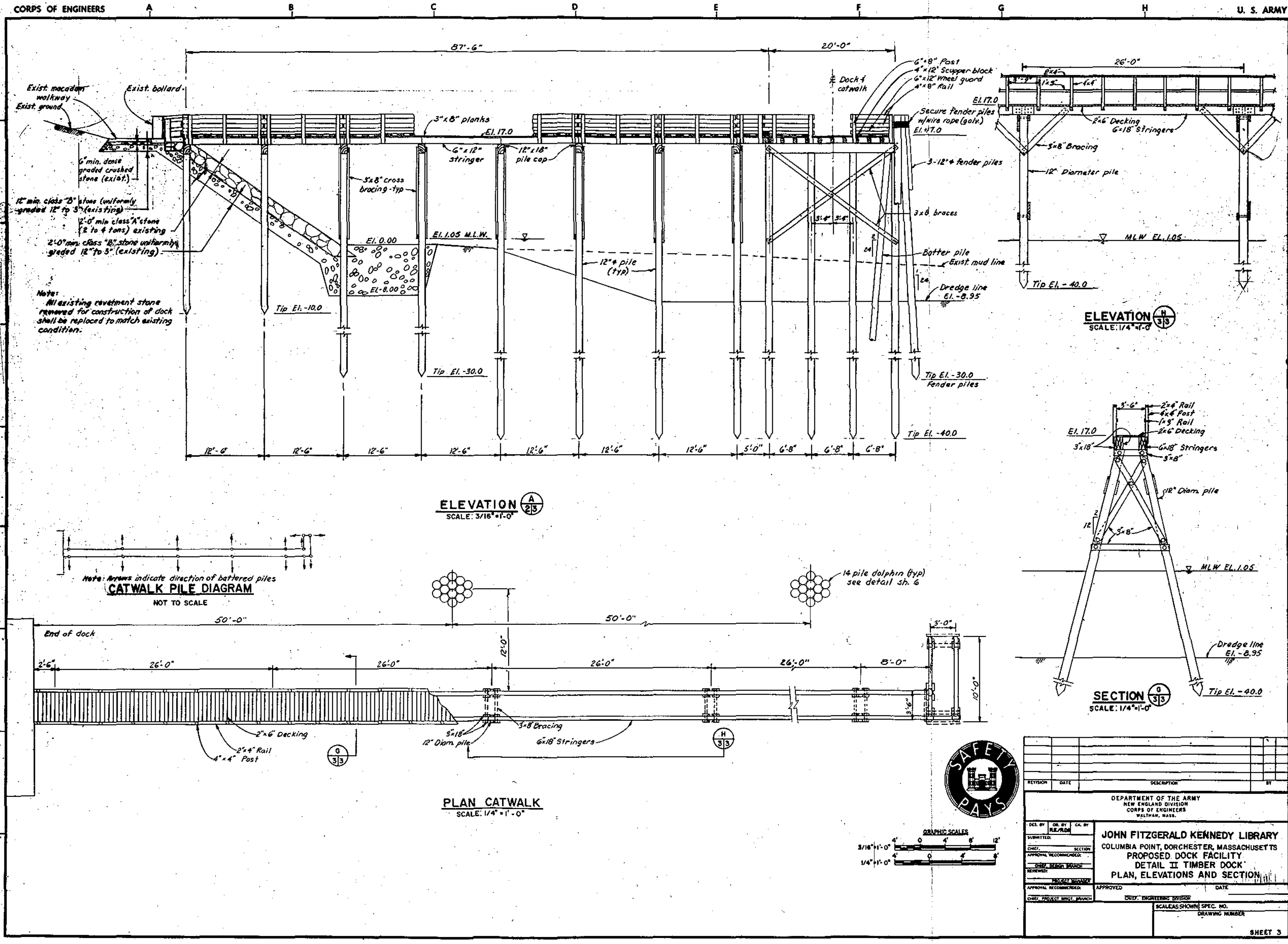
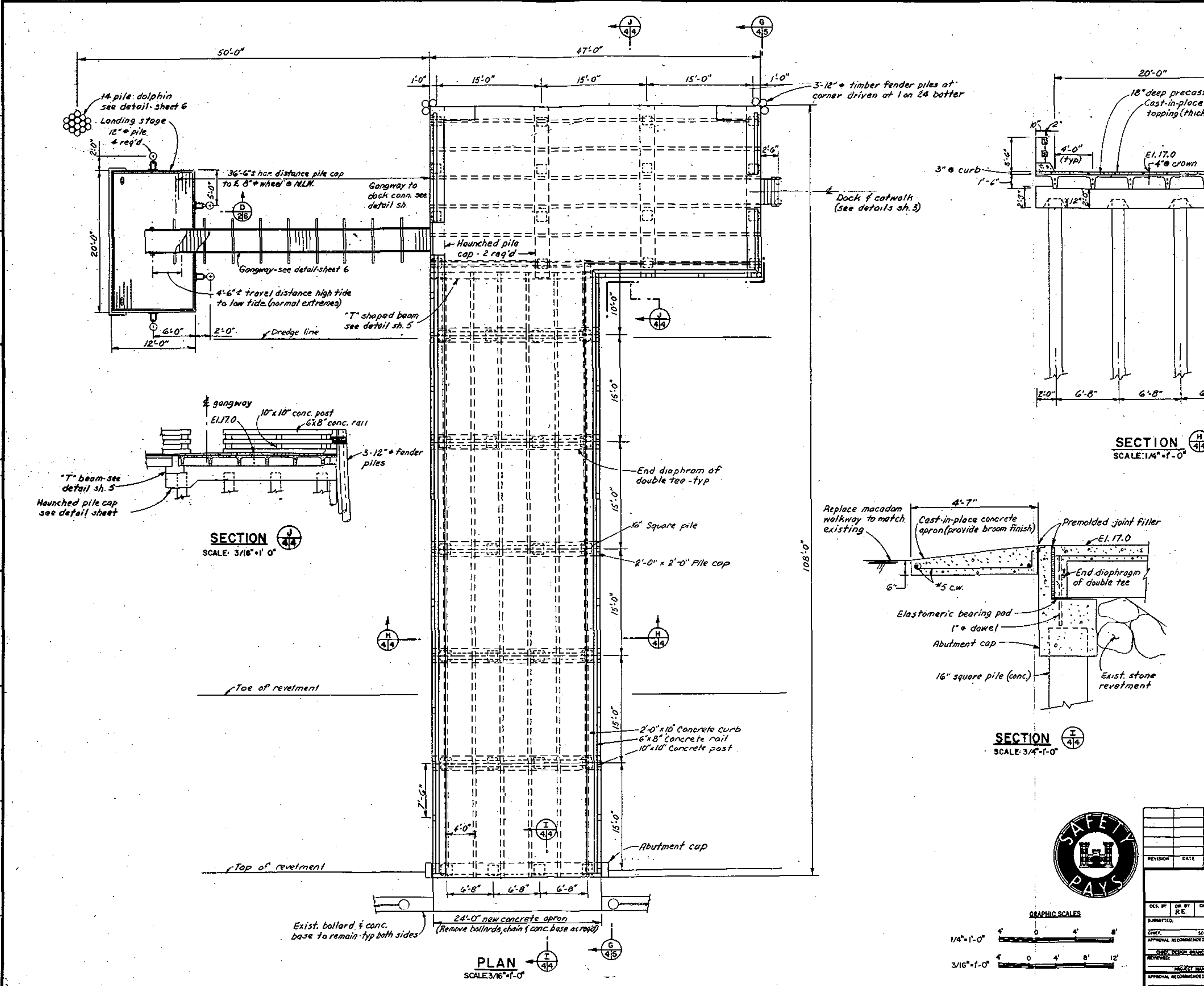

CORPS OF ENGINEERS
U. S. ARMY
87'-6"
20'-0"
Exist. macadam walkway
Exist. ground
Exist. bollard
6" min. dense graded crushed stone (exist.)
12" min. class "B" stone (uniformly graded 12" to 3") (existing)
2'-0" min. class "A" stone (2 to 4 tons) existing
2'-0" min. class "B" stone uniformly graded 12" to 3" (existing)
Note: All existing revetment stone removed for construction of dock shall be replaced to match existing condition.
3"x8" planks
El. 17.0
6"x12" stringer
12"x18" pile cap
3"x8" cross bracing - typ
El. 0.00
El. 1.05 M.L.W.
El. -8.00
12" ϕ pile (typ)
Tip El. -10.0
Tip El. -30.0
Dock & catwalk
6"x8" Post
4"x12" Scupper block
6"x12" Wheel guard
4"x8" Rail
Secure fender piles w/wire rope (galv.)
El. 17.0
3-12" ϕ fender piles
3x8 braces
Batter pile
Exist. mud line
Dredge line El. -8.95
Tip El. -30.0 Fender piles
Tip El. -40.0
12'-6"
5'-0"
6'-8"
ELEVATION A/2|3
SCALE: 3/16"=1'-0"
26'-0"
2x4
1x5
4x4
El. 17.0
2x6 Decking
6x18 Stringers
3x8 Bracing
12" Diameter pile
MLW El. 1.05
Tip El. -40.0
ELEVATION H/3|3
SCALE: 1/4"=1'-0"
3'-6"
2"x4" Rail
4x4 Post
1x5 Rail
2x6 Decking
3x18
6x18 Stringers
3x8
12" Diam. pile
MLW El. 1.05
Dredge line El. -8.95
Tip El. -40.0
SECTION G/3|3
SCALE: 1/4"=1'-0"
Note: Arrows indicate direction of battered piles
CATWALK PILE DIAGRAM
NOT TO SCALE
14 pile dolphin (typ) see detail sh. 6
50'-0"
12'-0"
End of dock
2'-6"
26'-0"
8'-0"
3'-0"
10'-0"
3'-6"
2"x6" Decking
2"x4" Rail
4"x4" Post
3x18
12" Diam. pile
3x8 Bracing
6x18 Stringers
PLAN CATWALK
SCALE: 1/4"=1'-0"
SAFETY PAYS
GRAPHIC SCALES
3/16"=1'-0"
1/4"=1'-0"
REVISION
DATE
DESCRIPTION
BY
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
JOHN FITZGERALD KENNEDY LIBRARY
COLUMBIA POINT, DORCHESTER, MASSACHUSETTS
PROPOSED DOCK FACILITY
DETAIL II TIMBER DOCK
PLAN, ELEVATIONS AND SECTION
APPROVED
DATE
CHIEF, ENGINEERING DIVISION
SCALE AS SHOWN
SPEC. NO.
DRAWING NUMBER
SHEET 3

PLATE 3

CORPS OF ENGINEERS U. S. ARMY



Notes:
1. All structural members for the dock are normal weight precast concrete, unless noted otherwise.
2. All structural members shall be "white" concrete to match existing concrete features at the J.F.K. Library.
3. 28 day compressive strength shall be as follows:
Precast concrete: $f'_c = 5000$ psi
Cast-in-place concrete: $f'_c = 4000$ psi

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

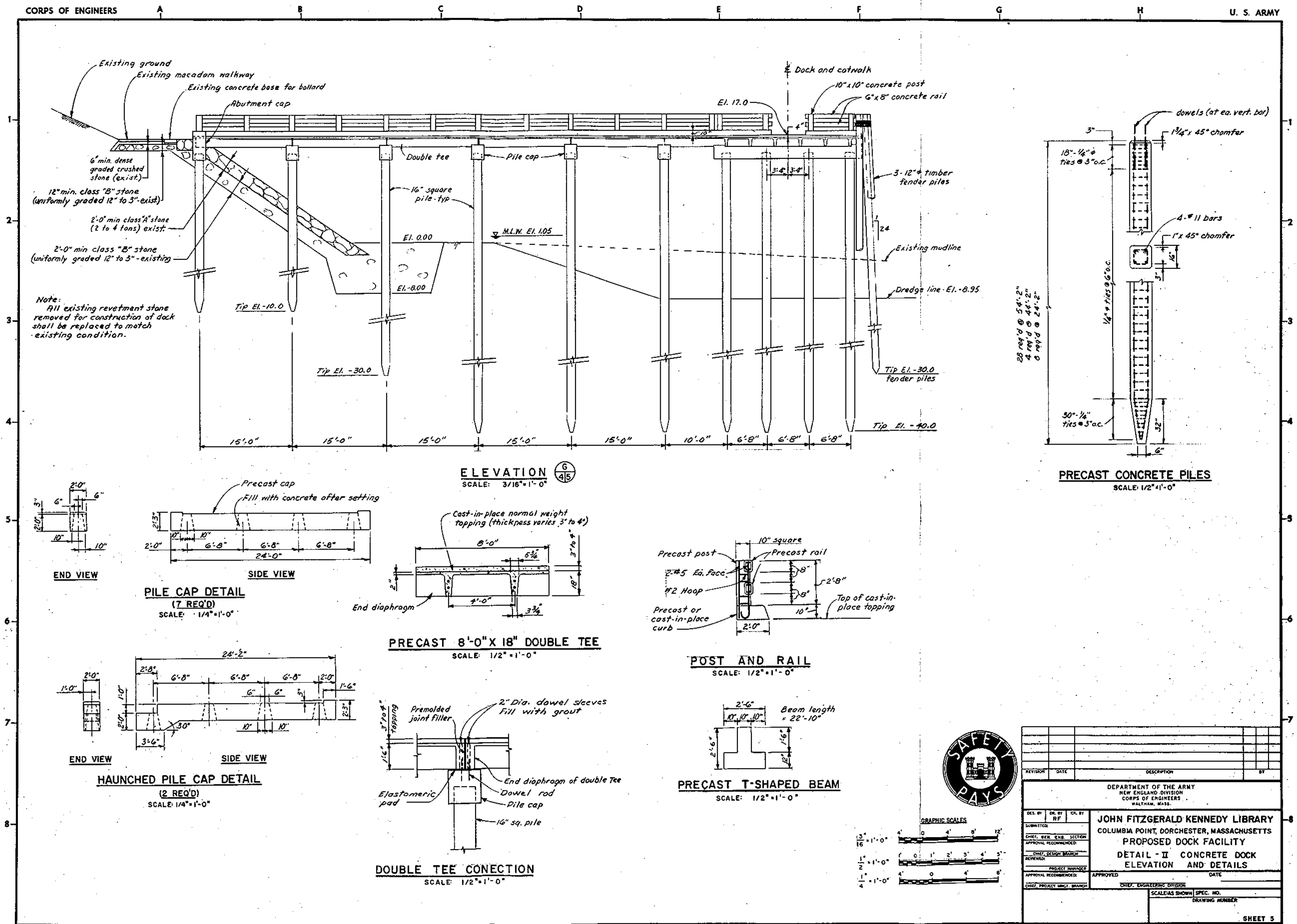
JOHN FITZGERALD KENNEDY LIBRARY
COLUMBIA POINT, DORCHESTER, MASSACHUSETTS

PROPOSED DOCK FACILITY
DETAIL-I CONCRETE DOCK
PLAN AND SECTIONS

SCALE AS SHOWN | SPEC. NO. | DRAWING NUMBER

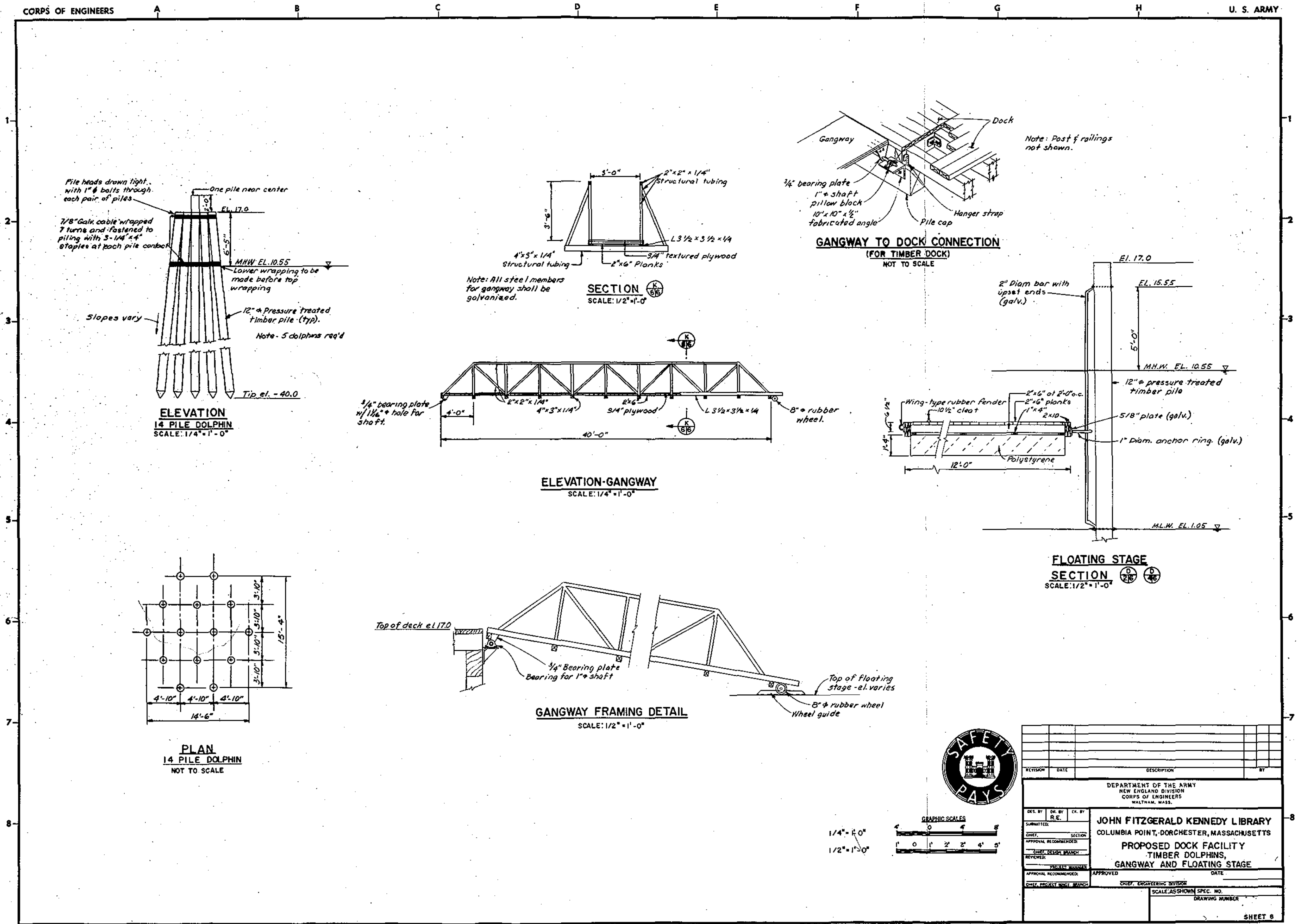
SHEET 4

PLATE 4



CORPS OF ENGINEERS
U. S. ARMY
Existing ground
Existing macadam walkway
Existing concrete base for bollard
Abutment cap
Dock and catwalk
10"x10" concrete post
6"x8" concrete rail
El. 17.0
dowels (at ea. vert. bar)
1 3/4" x 45° chamfer
6" min. dense graded crushed stone (exist.)
12" min. class "B" stone (uniformly graded 12" to 3" - exist)
2'-0" min class "A" stone (2 to 4 tons) exist.
2'-0" min class "B" stone (uniformly graded 12" to 3" - existing
Double tee
Pile cap
16" square pile - typ
3 - 12" ϕ timber fender piles
M.L.W. El. 1.05
El. 0.00
El. -8.00
Existing mudline
Dredge line - El. -8.95
Note:
All existing revetment stone removed for construction of dock shall be replaced to match existing condition.
Tip El. -10.0
Tip El. -30.0
Tip El. -30.0 fender piles
Tip El. -40.0
15'-0"
15'-0"
15'-0"
15'-0"
15'-0"
10'-0"
6'-8"
6'-8"
6'-8"
ELEVATION
SCALE: 3/16" = 1'-0"
4-#11 bars
1" x 45° chamfer
1/4" ϕ ties @ 6" o.c.
30" - 1/4" ϕ ties @ 3" o.c.
28 req'd @ 54'-2"
4 req'd @ 44'-2"
6 req'd @ 24'-2"
PRECAST CONCRETE PILES
SCALE: 1/2" = 1'-0"
Precast cap
Fill with concrete after setting
END VIEW
SIDE VIEW
24'-0"
PILE CAP DETAIL
(7 REQ'D)
SCALE: 1/4" = 1'-0"
Cast-in-place normal weight topping (thickness varies 3" to 4")
8'-0"
End diaphragm
PRECAST 8'-0" X 18" DOUBLE TEE
SCALE: 1/2" = 1'-0"
Precast post
10" square
Precast rail
2-#5 Ea. face
#2 Hoop
Precast or cast-in-place curb
Top of cast-in-place topping
POST AND RAIL
SCALE: 1/2" = 1'-0"
24'-2"
END VIEW
SIDE VIEW
HAUNCHED PILE CAP DETAIL
(2 REQ'D)
SCALE: 1/4" = 1'-0"
Premolded joint filler
2" Dia. dowel sleeves
Fill with grout
End diaphragm of double Tee
Elastomeric pad
Dowel rod
Pile cap
16" sq. pile
DOUBLE TEE CONECTION
SCALE: 1/2" = 1'-0"
Beam length = 22'-10"
PRECAST T-SHAPED BEAM
SCALE: 1/2" = 1'-0"
SAFETY PAYS
GRAPHIC SCALES
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
JOHN FITZGERALD KENNEDY LIBRARY
COLUMBIA POINT, DORCHESTER, MASSACHUSETTS
PROPOSED DOCK FACILITY
DETAIL - II CONCRETE DOCK
ELEVATION AND DETAILS
SCALE: AS SHOWN
SHEET 5

PLATE 5


CORPS OF ENGINEERS
U. S. ARMY
Pile heads drawn tight with 1" ϕ bolts through each pair of piles
One pile near center
EL. 17.0
7/8" Galv. cable wrapped 7 turns and fastened to piling with 3-1/4" x 4" staples at each pile contact
MHW EL. 10.55
Lower wrapping to be made before top wrapping
Slopes vary
12" ϕ Pressure treated timber pile (typ).
Note - 5 dolphins req'd
Tip el. - 40.0
ELEVATION
14 PILE DOLPHIN
SCALE: 1/4" = 1'-0"
3'-0"
2"x2" x 1/4" Structural tubing
3'-6"
L 3 1/2 x 3 1/2 x 1/4
4"x3" x 1/4" Structural tubing
3/4" textured plywood
2"x6" Planks
Note: All steel members for gangway shall be galvanized.
SECTION
SCALE: 1/2" = 1'-0"
Gangway
Dock
3/4" bearing plate
1" ϕ shaft pillow block
10"x10" x 1/2" fabricated angle
Pile cap
Hanger strap
Note: Post & railings not shown.
GANGWAY TO DOCK CONNECTION
(FOR TIMBER DOCK)
NOT TO SCALE
3/4" bearing plate w/ 1 1/16" ϕ hole for shaft.
4'-0"
2"x2"x1/4"
4"x3"x1/4"
2"x6"
3/4" plywood
L 3 1/2 x 3 1/2 x 1/4
8" ϕ rubber wheel.
40'-0"
ELEVATION-GANGWAY
SCALE: 1/4" = 1'-0"
El. 17.0
2" Diam bar with upset ends (galv.)
EL. 15.55
5'-0"
M.H.W. EL. 10.55
12" ϕ pressure treated timber pile
Wing-type rubber fender
10 1/2" cleat
2"x6" at 2'-0" o.c.
2"x6" planks
1"x4"
2x10
5/8" plate (galv.)
1" Diam. anchor ring. (galv.)
Polystyrene
12'-0"
M.L.W. EL. 1.05
FLOATING STAGE
SECTION
SCALE: 1/2" = 1'-0"
3'-10"
15'-4"
4'-10"
14'-6"
PLAN
14 PILE DOLPHIN
NOT TO SCALE
Top of deck el 17.0
3/4" Bearing plate
Bearing for 1" ϕ shaft
Top of floating stage - el. varies
8" ϕ rubber wheel
Wheel guide
GANGWAY FRAMING DETAIL
SCALE: 1/2" = 1'-0"
SAFETY PAYS
GRAPHIC SCALES
1/4" = 1'-0"
1/2" = 1'-0"
REVISION DATE DESCRIPTION BY
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
R.E.
JOHN FITZGERALD KENNEDY LIBRARY
COLUMBIA POINT, DORCHESTER, MASSACHUSETTS
PROPOSED DOCK FACILITY
TIMBER DOLPHINS,
GANGWAY AND FLOATING STAGE
APPROVED DATE
SCALE: AS SHOWN
SPEC. NO.
DRAWING NUMBER
SHEET 6
PLATE 6

SECTION B - PART 1

APPENDIX I

STRUCTURAL DESIGN CALCULATIONS

SECTION B - PART 1

APPENDIX I

Subject	Page

SUBJECT KENNEDY LIBRARY DOCK

COMPUTATION CRITERIA

COMPUTED BY D.D. CHECKED BY ________ DATE 6/30/86

CRITERIA DOCUMENTS

1. PIERS AND WHARVES, NAVFAC DM 25.1, NOV. 1980, DEPT. OF NAVY
2. FERRY TERMINALS AND SMALL CRAFT BERTHING FACILITIES, NAVFAC DM 25.5, JULY 1981, DEPT. OF NAVY
3. STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 13TH ED, 1983, A.A.S.H.T.O

CRITERIA FOR TIMBER DOCK (AASHTO PARA. 13.7, p. 200)

- PILE BENTS OVER 10 FT HIGH SHALL BE SWAY BRACED TRANSVERSELY W/ DIAG. BRACE ON EACH SIDE OF BENT
- PILE BENTS GENERALLY SHALL CONTAIN NOT LESS THAN 4 PILES
- PILE CAP MIN SIZE 10" X 10"
- BRACING MIN SIZE 3"X8"
- FLOORING. MIN. THICKNESS 3" (AASHTO PARA 13.9, p. 202)

CRITERIA FOR PRECAST CONCRETE DOCK

- PRECAST PILES SHALL HAVE CROSS-SECTIONAL AREA NOT LESS THAN 220 IN^2 WHEN USED IN SALT WATER (AASHTO 4.3.9.2, p. 47)
- VERT. REINF. FOR PILES SHALL NOT BE LESS THAN 4 BARS; MIN. REINF. 1½% OF CROSS-SECTIONAL AREA (AASHTO 4.3.9.6, p. 47)
- 3" CONC. COVER REQ. FOR PILES IN SALT WATER (AASHTO 4.3.9.9, p. 47)

VERTICAL LIVE LOADS

- DOCK = 250 PSF, OR AASHTO H-10 APPLIED NON-CONCURRENTLY; USE 15% IMPACT FACTOR FOR DESIGN OF SLABS, BEAMS, AND PILE CAPS (STR. ELEMENTS BELOW PILE CAPS NOT DESIGNED FOR IMPACT) REF. DM 25.1
- GANGWAY = 75 PSF REF DM 25.1 (p. 25.1-139)
- CATWALK = 100 PSF
- FLOATING STAGE = 25 PSF (PLUS L.L. REACTION OF GANGWAY) REF DM 25.5 (p. 25.5-33) CRITERIA FOR FLOATING PIERS (NOTE: DM 25.1, p. 25.1-75 STATES DESIGN LOAD OF 50 PSF - THIS APPEARS TO BE EXCESSIVE FOR THIS APPLICATION) ALSO, CHECK STAGE FOR 500# CONCENTRATED LOAD

NED FORM 223
27 Sept 49

NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION DATUM PLANES & TIDE ELEVATIONS
COMPUTED BY D. D. CHECKED BY DATE 6/30/86

	TIDE LEVEL		
	FEET NGVD	FEET BOSTON CITY BASE	FEET MLW DATUM
▽ MEAN HIGH WATER	+4.9	+10.55	+9.5
▽ MEAN SEA LEVEL	+0.2	+5.85	+4.8
▽ MEAN LOW WATER	-4.6	+1.05	0.0

NOTE:
BOSTON CITY BASE = NGVD + 5.65'

MAXIMUM WAVE HEIGHT = H_s = 3.4', t = 3.3 SEC.

STILL WATER LEVEL - EL. 10.3 FT NGVD (BLIZZARD CONDITION, 100 YEAR RECURRENCE INTERVAL)

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SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION DECK ELEVATION
COMPUTED BY D.D. CHECKED BY ______ DATE 6/30/86

GUIDANCE FOR ESTABLISHING DECK ELEVATION

1) FROM NAVFAC DM 25.1, p. 25.1-7
SET DECK ELEVATION SUCH THAT LOWEST POINT OF SUPERSTRUCTURE (FOR THIS DESIGN, BOTTOM OF PILE CAPS) IS AT AN ELEVATION EQUAL TO MEAN HIGH WATER PLUS 2/3 OF MAXIMUM WAVE HEIGHT PLUS 3 FEET FREEBOARD

$$\text{DECK EL.} = \underset{\text{MHW}}{10.55} + \tfrac{2}{3}\underset{\text{WAVE}}{(3.4)} + \underset{\text{FREE-BOARD}}{3} + \underset{\text{PILE CAP}}{1.5} + \underset{\text{STRINGER}}{1} + \underset{\text{PLANK}}{0.25}$$

= 18.57 FT BOSTON CITY BASE (FOR TIMBER ALTERNATIVE)

2) FROM NAVFAC DM 25.5, p. 25.5-23
SET DECK ELEVATION APPROXIMATELY ONE FOOT ABOVE EXTREME HIGH WATER

$$\text{DECK EL.} = \underset{\substack{\text{BLIZZARD}\\ \text{100 YR. STORM}}}{10.3} + \underset{\text{CONVERSION}}{5.65} + \underset{\text{FREEBOARD}}{1}$$

= 16.95 FT BOSTON CITY BASE

THE TOP OF THE EXISTING STONE REVETMENT ALONG WATERFRONT IS EL. 16.5 FT. BOSTON CITY BASE. ELEVATION OF BAY PLAZA VARIES BETWEEN EL. 16.68 AND 18.5 FT. BOSTON CITY BASE.

∴ SET DECK ELEVATION AT 17.0 FT BOSTON CITY BASE

(HIGHER DECK ELEVATION NOT WARRANTED SINCE BAY PLAZA WILL BE OVERTOPPED AND INACCESSIBLE WHEN WATER LEVEL EXCEEDS EL. 16.5)

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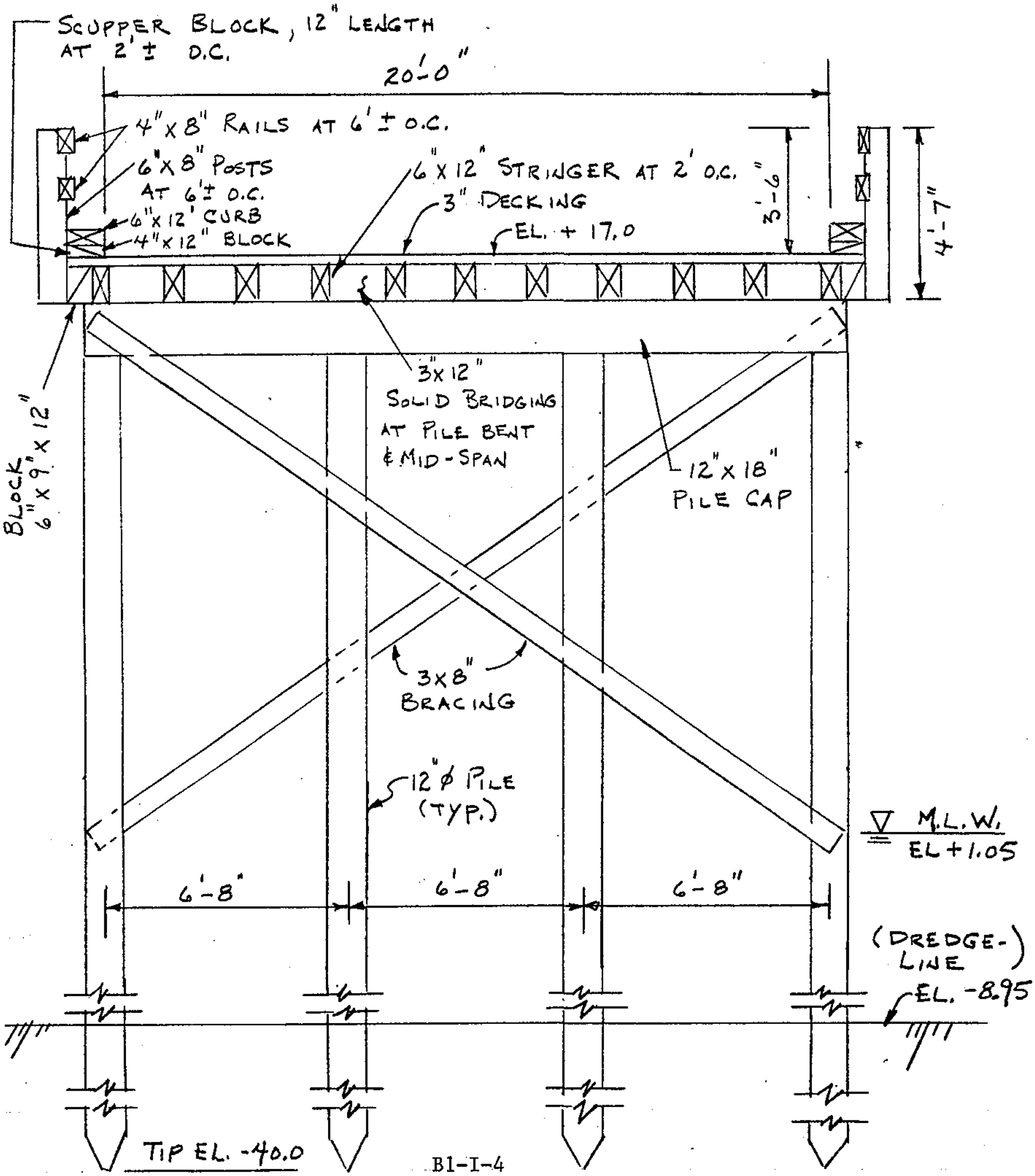
SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION TIMBER DOCK ALTERNATIVE
COMPUTED BY D.D. CHECKED BY ______ DATE 7/8 86

TIMBER DOCK - TYPICAL CROSS SECTION
PILE BENTS AT 12.5' O.C.



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NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION PILE LOAD - TIMBER ALTERNATIVE
COMPUTED BY D.D. CHECKED BY ______ DATE 11/24/86

SEE TYPICAL CROSS SECTION SHOWN ON P. 4 (TIMBER)
ASSUME WEIGHT OF TREATED TIMBER = 50 PCF (AASHTO p. 17)
USE UNIFORM LIVE LOAD OF 250 PSF

DEAD LOAD -

1. PILE CAP = (12 X 18)/144 X 21' X (50 PCF) = 1575 #
2. STRINGERS = (6 X 12)/144 X 12.5' X (50 PCF) X 11 = 3438 #
3. SOLID BRIDGING = (3 X 12)/144 X 1.5' (50 PCF) X 20 = 375 #
4. DECKING = (3/12) X 22' X 12.5' (50 PCF) = 3438 #
5. POSTS = (6 X 8)/144 X 4.58' X (50 PCF) X 6 = 458 #
6. RAILS = (4 X 8)/144 X 12.5' X (50 PCF) X 4 = 556 #
7. CURBS = (6 X 12)/144 X 12.5' X (50 PCF) X 2 = 625 #
8. SCUPPER BLOCKS = (4 X 12)/144 X (12.5'/2) X (50 PCF) X 2 = 208 #
9. BRACING = (3 X 8)/144 X 25' X (50 PCF) X 2 = 417 #
10. PILES (54' ± LENGTH; AT MLW, 41' SUBMERGED & 13' IN DRY)
$= [\pi(6)^2/144 \times 13' \times (50\ PCF) + \pi(6)^2/144 \times 41' \times (50-64.2\ PCF)] \times 4$
$= (510 - 457) \times 4 = 212\ \#$
11. BLOCKING = (6 X 9)/144 X 1' X (50 PCF) X 6 = 113 #

TOTAL DEAD LOAD = 11,415 # PER BENT

LIVE LOAD = 20' (12.5') (250 PSF) = 62,500 # PER BENT

DESIGN LOAD PER PILE = (11,415 + 62,500)/4

= 18,479 # = 9.24 TONS PER PILE

USE 10 TONS PER PILE FOR PRELIMINARY DESIGN (TIMBER)

SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION TIMBER ALTERNATIVE - PILE CAPS
COMPUTED BY D. D. CHECKED BY DATE 11/24/86

TIMBER DOCK - STRESS CHECK OF PILE CAPS

- TOTAL DEAD LOAD ON PILE CAP (REF. p. 5); LENGTH OF CAP = 20'

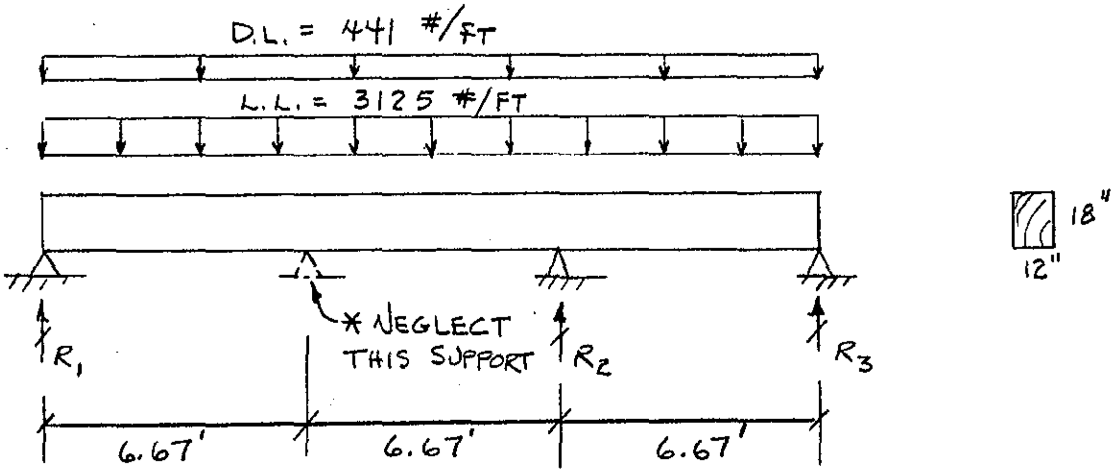
PILE CAP	1575 #
STRINGERS	3438
SOLID BRIDGING	375
DECKING	3438
TOTAL	8826 # ON PILE CAP

D.L. (CONVERT TO LINE LOAD) = 8826/20 = 441 #/FT

- UNIFORM LIVE LOAD = 250 PSF; PILE BENTS AT 12.5' O.C.

L.L. (CONVERT TO LINE LOAD) = 12.5 (250) = 3125 #/FT

- PERFORM ANALYSIS

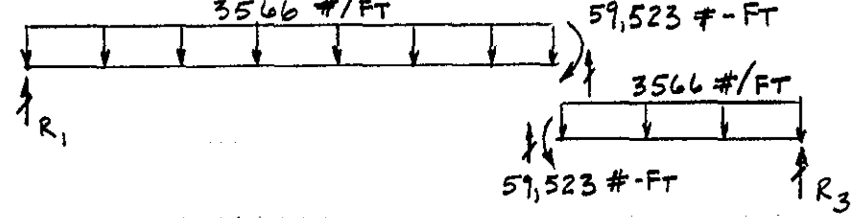


* NEGLECT SUPPORT TO ACCOUNT FOR POSSIBLE PILE SETTLEMENT OR ELASTIC SHORTENING (REF. NAVFAC DM 25.1 p. 25.1-70)

SOLVE BY THREE MOMENT THEORM, I IS CONSTANT

$$\cancel{M_1}^{0}\frac{l_1}{I} + 2M_2\left(\frac{l_1}{I} + \frac{l_2}{I}\right) + \cancel{M_3}^{0}\frac{l_2}{I} = -\frac{1}{4}\left(\frac{w_1 l_1^3}{I} + \frac{w_2 l_2^3}{I}\right)$$

$$M_2 = -\frac{1}{8}(3566)(13.33^3 + 6.67^3)/(13.33 + 6.67) = -59{,}523 \text{ \#-FT}$$



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CORPS OF ENGINEERS, U.S. ARMY

SUBJECT KENNEDY LIBRARY DOCK

COMPUTATION TIMBER ALTERNATIVE - PILE CAPS

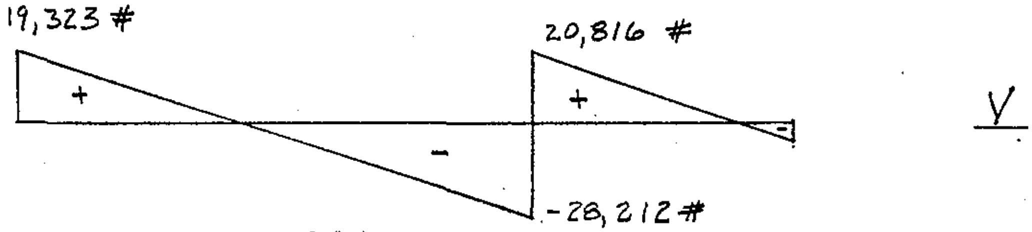
COMPUTED BY D.D. CHECKED BY ______ DATE 11/24/86

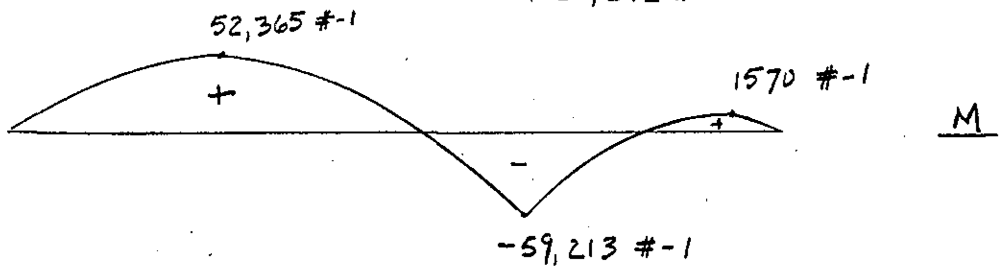
TIMBER DOCK - STRESS CHECK OF PILE CAPS (CONT.)

$$R_1 = \frac{3566(13.33)(13.33/2) - 59022}{13.33} = 19{,}323\ \#\uparrow$$

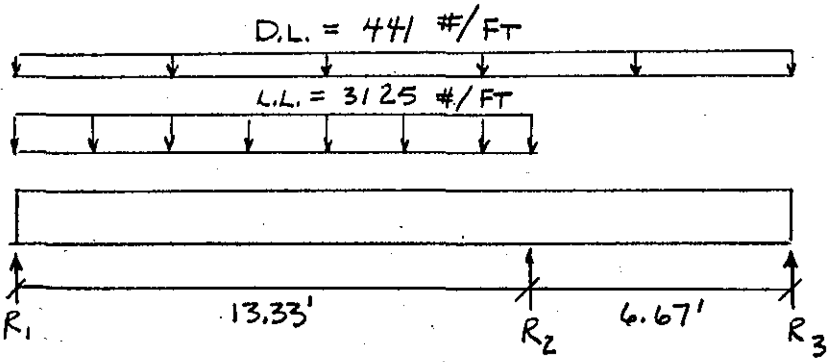
$$R_3 = \frac{3566(6.67)(6.67/2) - 59523}{6.67} = 2{,}969\ \#\uparrow$$

$$R_2 = 3566(20) - 19{,}323 - 2{,}969 = 49{,}028\ \#\uparrow$$



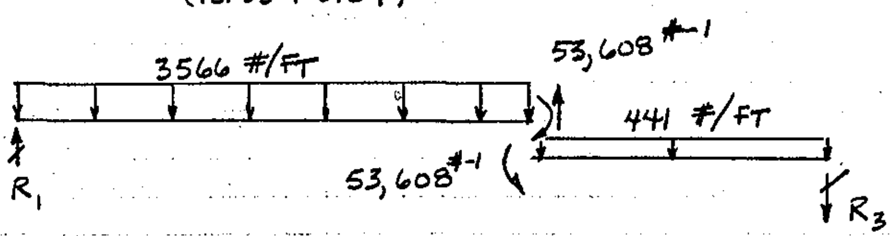


CHECK CONDITION WITH L.L. ON ONE SPAN ONLY,



SOLVE BY THREE MOMENT THEORM,

$$M_2 = -\frac{1}{8}\frac{(3566 \times 13.33^3 + 441 \times 6.67^3)}{(13.33 + 6.67)} = -53{,}608\ \#\text{-FT}$$



NED FORM 223
27 Sept 49

NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

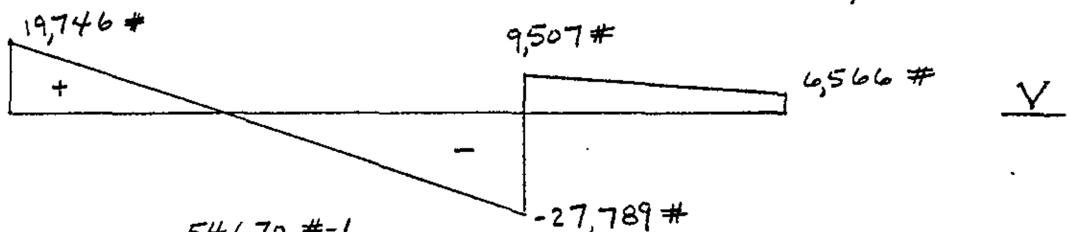
SUBJECT: KENNEDY LIBRARY DOCK
COMPUTATION: TIMBER ALTERNATIVE - PILE CAPS
COMPUTED BY: D.D. CHECKED BY: DATE: 11/24/86

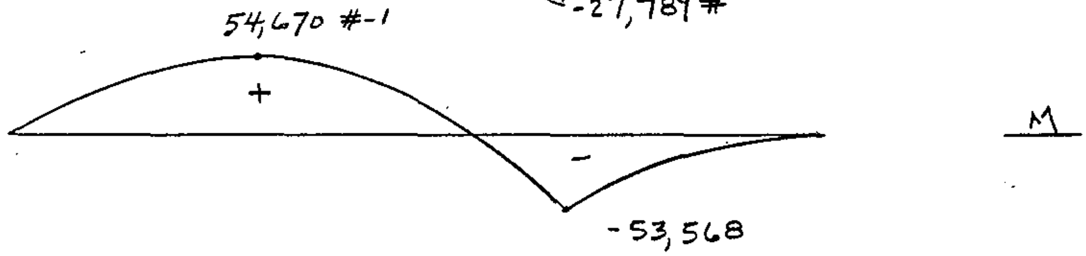
TIMBER DOCK - STRESS CHECK OF PILE CAPS (CONT.)

$$R_1 = \frac{3566\,(13.33)(13.33/2) - 53{,}608}{13.33} = 19{,}746\ \#\uparrow$$

$$R_3 = \frac{53{,}608 - 441\,(6.67)(6.67/2)}{6.67} = 6{,}566\ \#\downarrow$$ CHECK CONNECTION, CAP WILL LIFT OFF PILE

$$R_2 = 3566\,(13.33) + 441\,(6.67) - 19{,}746 + 6566 = 37{,}296\ \#\uparrow$$





CHECK STRESSES -
ASSUME FULL DIMENSION TIMBER TO BE USED FOR CAP;
USE No. 1 DENSE SR SOUTHERN PINE, $F_b = 1550$ psi, $F_V = 110$ psi
(AASHTO p. 189)

$$S = bh^2/6 = 12\,(18)^2/6 = 648\ \text{in}^3$$

$$f_b = M/S = 59{,}213\,(12)/648 = 1097\ \text{psi} < 1550\ \text{psi} \quad \text{O.K.}$$

CALCULATE HORIZ. SHEAR USING DESIGN SHEAR LOCATED AT A DISTANCE FROM SUPPORT EQUAL TO 3 TIMES BEAM DEPTH OR AT 1/4 PT ON SPAN, WHICHEVER IS LESS (AASHTO 13.3.1 p. 193)

$$V = 28{,}212 - (13.33/4)(3566) = 16{,}328\ \#$$

$$f_V = \frac{3V}{2A} = (3/2)(16{,}328)/(12)(18) = 113\ \text{psi} \approx 110\ \text{psi} \quad \text{O.K.}$$

USE 12" X 18" PILE CAP

SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION TIMBER ALTERNATIVE- STRINGERS
COMPUTED BY D.D. CHECKED BY ______ DATE 11/25/86

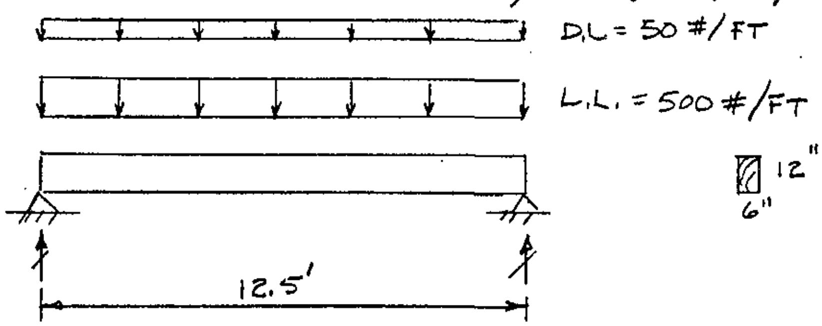
TIMBER DOCK- STRESS CHECK OF STRINGERS

TRY 6"X12" STRINGERS AT 2' O.C.; ASSUME FULL DIMENSION TIMBER, USE NO. 1 DENSE SR SOUTHERN PINE, $F_b = 1550$ psi, $F_V = 110$ psi, $E = 1.6 \times 10^6$ psi

- DEAD LOAD
  STRINGER = (6"x12")/144 X (50 PCF) = 25 #/FT
  DECKING = (3"/12) X 2' x (50 PCF) = 25 #/FT
  50 #/FT

- UNIFORM LIVE LOAD = 250 PSF

L.L. (CONVERT TO LINE LOAD) = 2' (250 PSF) = 500 #/FT



$M_{MAX} = (550)(12.5)^2/8 = 10{,}742$ #-FT

$S = bh^2/6 = 6(12)^2/6 = 144 \text{ IN}^3$, $I = bh^3/12 = 6(12)^3/12 = 864 \text{ IN}^4$

$f_b = 10{,}742(12)/144 = 895$ psi < 1550 psi O.K.

$V_{MAX} = (550)(12.5/2) = 3438$ #

$f_V = \frac{3V}{2A} = \frac{3(3438)}{2(6)(12)} = 72$ psi < 110 psi O.K.

$\Delta = \frac{5 w l^4}{384 EI} = \frac{5(550)(12.5)^4(12)^3}{384(864)(1.6 \times 10^6)} = 0.22'' < l/240 = 12.5(12)/240$
$< 0.63''$ O.K.

USE 6"X 12" STRINGERS AT 2' O.C. — NOTE: CALCULATED STRESSES ARE LOW. DURING FINAL DESIGN, CHECK STRINGERS FOR AASHTO H-10 LOAD. CAN POSSIBLY WIDEN SPACING OR REDUCE SIZE.

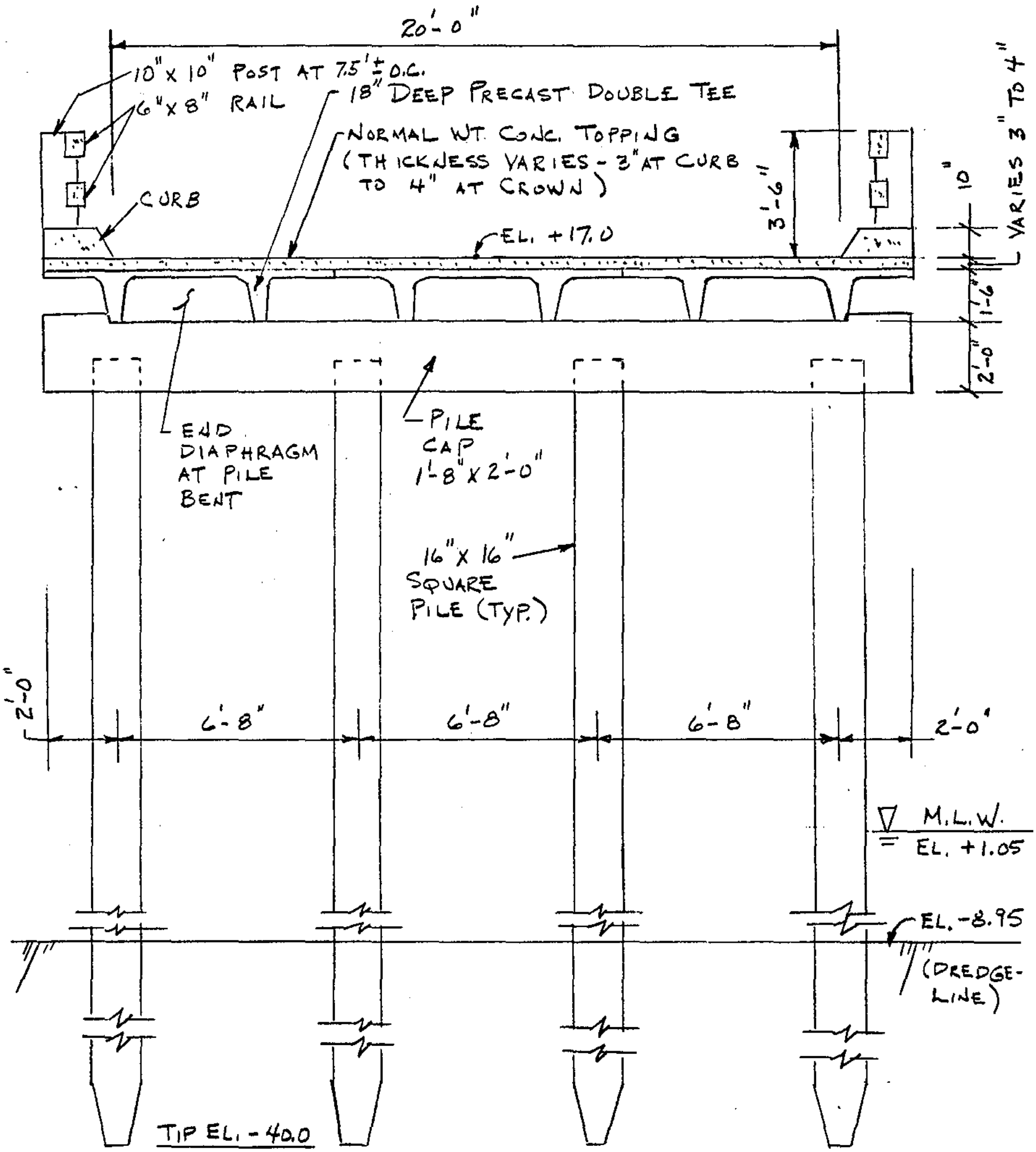
SUBJECT KENNEDY LIBRARY DOCK

COMPUTATION PRECAST CONCRETE ALTERNATIVE

COMPUTED BY D.D. CHECKED BY DATE 7/8/86

PRECAST CONCRETE DOCK - TYPICAL CROSS SECTION

PILE BENTS AT 15' O.C.



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CORPS OF ENGINEERS, U.S. ARMY

SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION PILE LOAD - PRECAST CONCRETE ALTERNATIVE
COMPUTED BY D.D. CHECKED BY DATE 7/28/86

SEE TYPICAL CROSS SECTION SHOWN ON P. 10 (PRECAST CONCRETE)
ALL MEMBERS NORMAL WEIGHT CONCRETE AT 150 PCF
USE UNIFORM LIVE LOAD OF 250 PSF

DEAD LOAD -
1. PILE CAP = (1.67' x 2') x 24' x (150 PCF) = 12,024 #
2. DOUBLE TEE (FROM PRECAST CONCRETE INSTITUTE DESIGN HANDBOOK, WT. OF 18" DEEP DOUBLE TEE WITH 8' TOP FLANGE (8 DT 18) LISTED AS 45 PSF; ADD 10% TO ACCOUNT FOR DIAPHRAGMS)
= 24' x 15' x (45 PSF) x 1.10 = 17,820 #
3. CONC. TOPPING = (3½" AVE/12) x 24' x 15' (150 PCF) = 15,750 #
4. CURBS = (10"/12) x 2' x 15' x (150 PCF) x 2 = 7500 #
5. POSTS = (10" x 10")/144 x 2.67' x (150 PCF) x 4 = 1113 #
6. RAILS = (6" x 8")/144 x 15' x (150 PCF) x 4 = 3000 #
7. PILES (53' ± LENGTH; AT MLW, 41 SUBERGED & 12' IN DRY)
= 4 x [(16" x 16")/144 x 12' x (150 PCF) + (16" x 16")/144 x 41' x (150-64.2 PCF)]
= 4 x (3200 + 6254) = 37,816 #

TOTAL DEAD LOAD = 95,023 # PER BENT

LIVE LOAD = 20' (15') (250 PSF) = 75,000 # PER BENT

DESIGN LOAD PER PILE = (95,023 + 75,000)/4

= 42,506 # = 21.25 TONS PER PILE

<u>USE 22 TONS PER PILE FOR PRELIMINARY DESIGN (PRECAST CONCRETE)</u>

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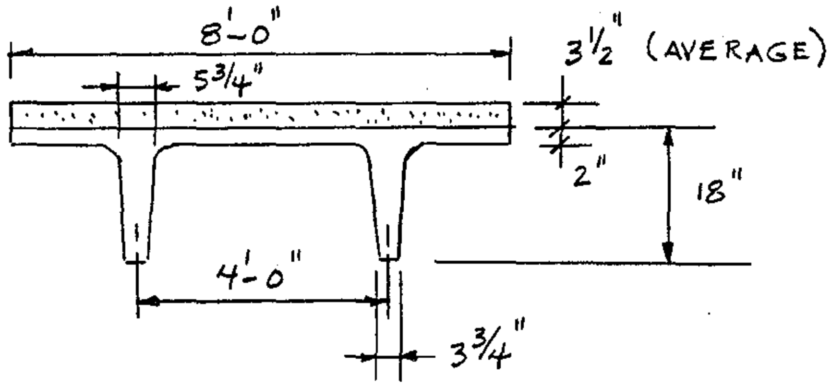
SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION PRECAST CONCRETE ALTERNATIVE
COMPUTED BY D.D. CHECKED BY DATE 11/25/86

PRECAST CONCRETE DOCK - STRESS CHECK DOUBLE TEE WITH COMPOSITE TOPPING

REF. PCI DESIGN HANDBOOK 8 DT 18 P. 3-16

PRECAST DOUBLE TEE $f'_c = 5000$ psi, $n = 7$, $f_{ci} = 3500$ psi
CAST-IN-PLACE TOPPING $f'_c = 4000$ psi, $n = 8$, NORMAL WEIGHT



PILE BENTS SPACED AT 15' O.C.

SECTION PROPERTIES -

	WITHOUT TOPPING	WITH TOPPING
A	344 in^2	
I	9300 in^4	16,299 in^4
y_b	13.27 in	16.26 in
y_t	4.73 in	5.24 in
Z_b	701 in^3	1002 in^3
Z_t	1966 in^3	3111 in^3

COMPOSITE PROPERTIES

	A	$\bar{y}$ ABOVE BOT.	$A\bar{y}$
8 DT 18	344	13.27	4565 in^3
TOPPING	$(7/8)(3.5)(8)(12) = 294$	19.75	5807
	638 in^2		10,372 in^3

COMPOSITE $y_b = 10{,}372/638 = 16.26"$
$y_t = 18 + 3.5 - 16.26 = 5.24"$

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SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION PRECAST CONCRETE ALTERNATIVE
COMPUTED BY D.D. CHECKED BY ______ DATE 11/25/86

STRESS CHECK DOUBLE TEE WITH TOPPING (CONT.)

$$\text{COMPOSITE } I = 9300 + 344(16.26-13.27)^2 + 8(12)(3.5)^3/12 + 294(19.75-16.26)^2$$

$$= 9300 + 3075 + 343 + 3581 = 16,299 \text{ IN}^4$$

– DEAD LOAD

8 DT 18		358 #/FT
TOPPING	(3.5"/12)(8')(150 PCF) =	350 #/FT
TOTAL		708 #/FT

– UNIFORM LIVE LOAD = 250 PSF

L.L. (CONVERT TO LINE LOAD) = 8'(250 PSF) = 2000 #/FT

– TRY PRESTRESSING STRAND PATTERN AS FOLLOWS:
4 - 1/2" ϕ STRANDS (2 IN EACH STEM)
STRAIGHT STRAND f_{pu} = 270 KSI, A = 0.153 IN^2 (EA. STRAND)

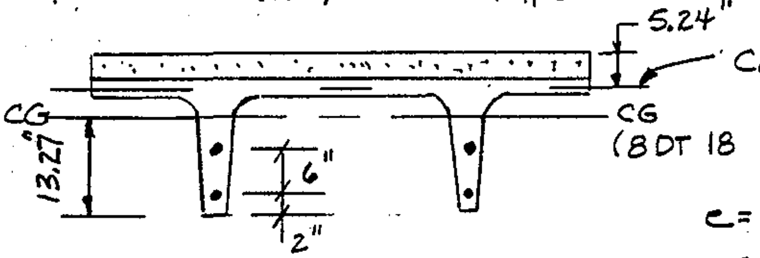
f_{si} = 0.7 (270) = 189 KSI
ASSUME 20% LOSSES
f_{se} = 0.8 (189) = 151 KSI

4 STRANDS A_{ps} = 4 (0.153) = 0.612 IN^2

P_i = 0.612 (189) = 115.7 KIPS

ASSUME 10% INITIAL LOSS, P_o = 0.9 (115.7) = 104.1 KIPS

P = 0.612 (151) = 92.4 KIPS



e = 13.27" – 5" = 8.27" (STRAIGHT STRAND)

DEAD LOAD (8 DT 18) $M_{DL} = 358(15)^2/8 = 10,069$ #-FT

SUPERIMPOSED DEAD LOAD $M_{SDL} = 350(15)^2/8 = 9,844$ #-FT

LIVE LOAD $M_{LL} = 2000(15)^2/8 = 56,250$ #-FT

SUBJECT KENNEDY LIBRARY DOCK
COMPUTATION PRECAST CONCRETE ALTERNATIVE
COMPUTED BY D.D. CHECKED BY ______ DATE 11/26/86

STRESS CHECK DOUBLE TEE WITH TOPPING (CONT.)

INVESTIGATE STRESSES: + = COMPRESSION, − = TENSION

LOAD	SUPPORT – RELEASE $P_o = 104.1$ KIPS		MIDSPAN – SERVICE LOADS $P = 92.4$ KIPS	
	f_b	f_t	f_b	f_t
P/A	+303	+303	+267	+267
Pe/Z	+1228	−438	+1090	−387
M_{DL}/Z			−172	+61
M_{SDL}/Z			−169	+60
$M_{LL}/Z_{COMPOSITE}$			−673	+217
STRESS PSI	+1531	−135	+343	+218
ALLOWABLE STRESS PSI	$0.60 f_c'$ +2100 O.K.	$3\sqrt{f_{ci}'}$ −177 O.K.	$6\sqrt{f_c'}$ −424 O.K.	$0.45 f_c'$ +1350 O.K.

CHECK ULTIMATE CAPACITY OF COMPOSITE SECTION.
COMPUTE ULT. MOM. PER AASHTO 3.22.4 p. 33

$$M_U = 1.3\,(1.0\text{ D.L.} + 2.2\text{ L.L.}) = 1.3\left[(10{,}069 + 9844) + 2.2\,(56{,}250)\right]$$

$$= 186{,}762\ \#\text{-FT} = 187\ \text{K-FT}$$

REF. PCI HANDBOOK, TABLE 5.2.1

$$\bar{\omega}_p = \frac{A_{PS}}{bd}\ \frac{f_{PU}}{f_c'} = \frac{0.612}{(8\times12)(16.5)} \times \frac{270\text{ KSI}}{3\text{ KSI}} = 0.035$$

$$K_U = 90.5\ ,\quad M_U = K_U\ bd^2/12{,}000$$

$$M_U = 90.5\,(8\times12)(16.5)^2/12{,}000 = 197\ \text{K-FT} > 187\ \text{K-FT}\quad \text{O.K.}$$

USE 8 DT 18 PRECAST DOUBLE TEE W/ 3½ COMPOSITE TOPPING

NOTE: COMPUTED STRESSES ARE LOW. CAN POSSIBLY REDUCE SIZE OF DOUBLE TEE DURING FINAL DESIGN.

SECTION B - PART 1

APPENDIX II

GEOTECHNICAL ENGINEERING REPORT

JOHN F. KENNEDY LIBRARY-PROPOSED BOAT PIER

GEOTECHNICAL CONSIDERATIONS

1. Introduction. Consideration is being given to the construction of a 135 ft. dock with associated cat walks, gangways and floating stages at the John F. Kennedy Library on Columbia Pt. in Dorchester, Massachusetts. The proposed docking facility and associated structures are shown on the plates which accompany this report. It is proposed to found the dock and appurtenant facilities on a concrete or timber pile foundation. The foundation conditions were evaluated to establish the required depths to which piles must be driven in order to attain the required load bearing capacity.

2. Topographic Features. The project is located in the coastal lowland physiographic section of New England. The project site is shown on the USGS "Boston South, Mass." quadrangle map. The site is in a topographic low known as the Boston Basin which is a prominent indentation in the coastline. The basin is underlain by softer rock types which have been eroded more than the adjacent rocks. Glacial deposits and marine sediments covering the rock were modified through sea level changes to form the irregularly shaped coast around Boston Harbor. Through urban development, fills have been added to numerous construction sites throughout the area including the coast.

The project is located just offshore of coastal lowlands which rise only to about 10 feet NGVD except for the local elongate hills or drumlins which punctuate the land surface rising to 50 feet or more. These hills continue seaward forming the numerous Boston Harbor islands which include Thompson Island. Submerged drumlins have been altered by wave action to form tombolos, bars, and spits.

3. Geologic Features.

The proposed project site is located in an area of the coast known as the Boston Basin, which is a topographic feature related to a structural and erosional depression in the rock. The rocks in the Basin are folded and faulted sedimentary and volcanic types which are surrounded by older and harder igneous and metamorphic rocks. Unconsolidated glacial and marine deposits overlie the bedrock.

Unlike the filled area just to the west, the proposed pier site is partially over only natural sediments (the fill on the west tapers out at approximately Sta 0+80) consisting of a surface layer of about 10 to 20 feet of loose sands or silts, the top of which is actively worked by wave and tidal action. This granular material overlies about 30 to 50 feet of gray clay of glaciomoraine origin which in turn overlies 10 to 40 feet of a dense sandy till over an undulating bedrock surface. Some minor artesian conditions were noted in the till layer of FD 86-1A and in an upper sand layer (probably a sand lense interbedded with glacial clays) of FD 86-2 (FD-86-1A and FD-86-2 are borings that were performed for this study. It is believed that the observed pressure head is the result of loading on the clay from the dumped fill on land to the west and northwest. The artesian pressure is of no consequence since it is of minor magnitude. The till bottoms out abruptly on fresh, tight bedrock, a gray argillite. This rock is known as Cambridge Argillite, one of the major sedimentary rock units of the Boston Basin. The two borings for this project intercepted a local high in the bedrock surface where the rock is only about 60 to 80 feet below the surface. In contrast, borings formerly performed in connection with the design of the John F. Kennedy Library itself intercepted bedrock at depths of over 120 feet.

4. Subsurface Explorations. Two borings, FD 86-1 and FD 86-2, were completed specifically for this study. The field logs of these borings are attached and were used to develop the soil profile shown on Sketch 1 and the design subsurface soil profiles as shown on the pile capacity design curves (Sketches 2 and 3).

Subsurface information was also obtained from explorations previously performed for the design of the John F. Kennedy Library. The explorations were performed by Clarence Welti Associates of Glastonbury, CT under the inspection and direction of Haley & Aldrich, Inc. of Cambridge, MA. The borings were performed in March and April of 1976. In making an analysis of subsurface conditions near the Library, foundation design reports performed for the Library by Haley & Aldrich, Inc. were consulted. Borings from their report that were referred to in performing our analyses were continued to bedrock. The subsurface information obtained by Haley & Aldrich for the Library provided a general understanding of the subsurface conditions to be encountered and aided in planning the two borings performed for this study.

5. Subsurface Conditions. A generalized soil profile developed from the logs of the borings performed for this study is shown on Sketch 1. The western portion of the site is overlain by a 14 to 18 foot layer of loose (5 to 7 blows) miscellaneous fill consisting of a mixture of sand, gravel, silt, cinders, wood, and other organic and inorganic debris. A 10 to 12 foot layer of loose to dense (7 to 34 blows) poorly graded sands (SP) covers the harbor bottom and extends beneath the fill at the west end of the site. The sand layer is underlain by a 20 to 25 foot layer of stiff (10 to 17 blows) interbedded clays and silts of low plasticity (CL) with sand lenses (SP). This material is underlain by a 10 to 15 foot layer of stiff (7-18 blows) clay of high plasticity (CH), which is underlain by a 15 to 20 foot layer of stiff to very stiff (8-30 blows) clays of low plasticity (CL). The clays are underlain by 5 to 20 feet of dense to very dense (29-101 blows) glacial till consisting of silty, gravelly sand (SP). Bedrock was encountered below the till layer in each boring.

Groundwater at the site appears to reflect the fluctuation in tide levels. The tide range at the site is approximately 9.5 feet.

6. Design Parameters. Design parameters for the project were estimated from standard penetration test data, visual examination of the soil samples, and experience with similar materials. Laboratory testing was not considered necessary and therefore, no tests were performed.

Design soil profiles were developed for the filled area at the west end of the proposed pier at Station 0+10 and for the section of pier which runs from the toe of the riprap slope at Station 0+35 to the east end of the pier. The estimated design parameters including in place densities (γ sat), pile-soil friction angle (δ), and cohesion (c) are shown on the design soil profiles on Sketches 2 and 3 and are summarized in the following table:

Station 0+10
(Pile Capacity Curve No. 1)

Elevation (Ft. BCB)	γ sat (pcf)	δ	c (psf)
11.5 to 0.0	120	22°	0
0.0 to -12.0	125	29°	0
-12.0 to -34.0	125	7°	400
-34.0 to -61.0	125	0	700
below -61.0	140	34°	0

Station 0+35 to East End
(Pile Capacity Curve No. 2)

-10.0 to -34.0	125	7°	400
-34.0 to -60.0	125	0	700
below -60.0	140	34°	0

7. Pile Design. Friction piles were designed in accordance with Corps of Engineers' Manual EM 1110-2-2906, "The Design of Pile Structures and Foundations".

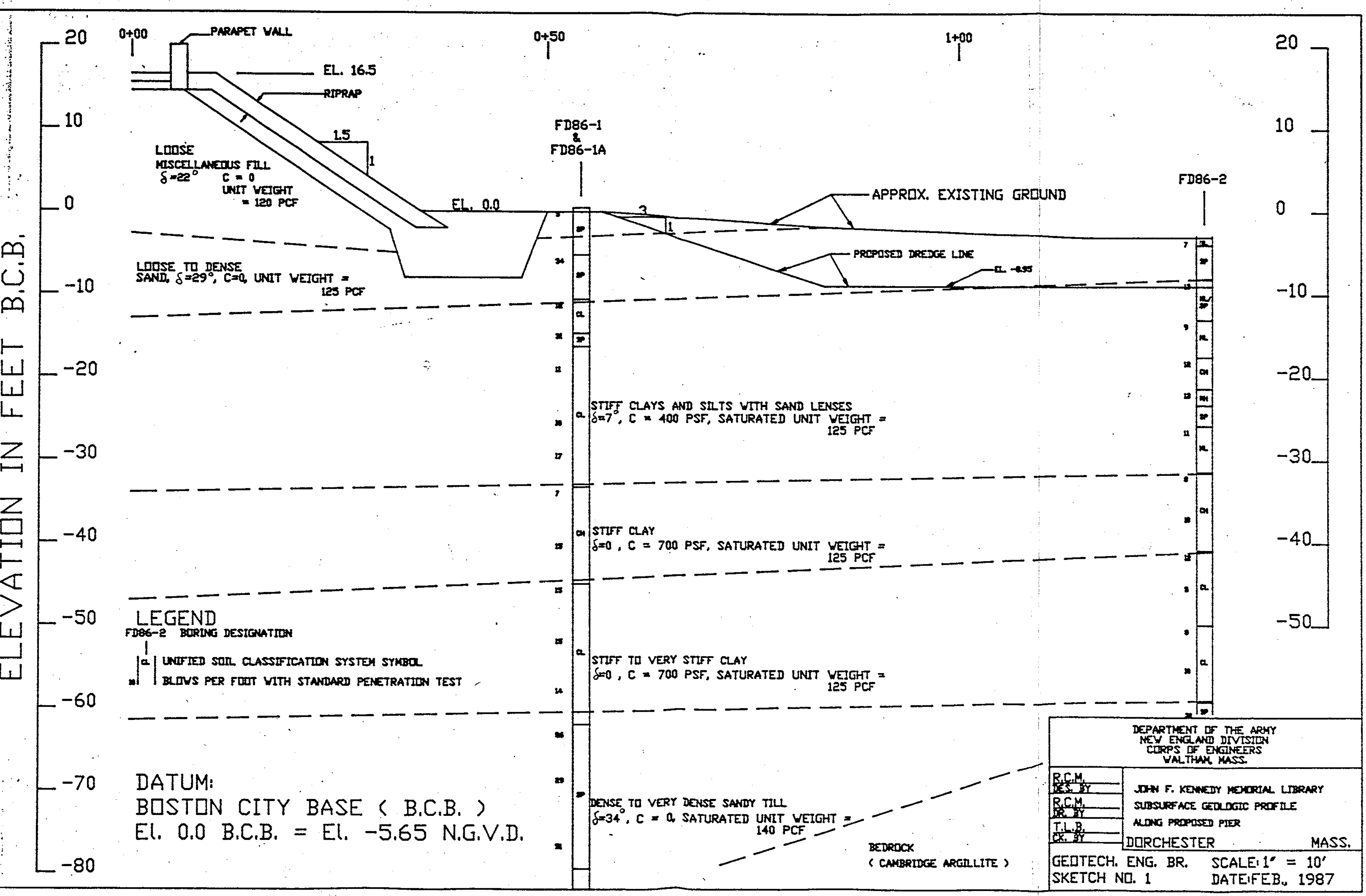
A computer program was developed by NED personnel that utilizes design soil parameters to generate pile design capacity curves as shown on Sketches 2 and 3. Pile capacity curves were developed for soil profiles at two locations, one near the Library at Sta 0+10 and one at the end of the dock in the area to be dredged at Sta 0+85. Pile capacity curves were developed at each location for both 8 or 7 inch tip diameter timber piles and 16 inch x 16 inch precast concrete piles. The required load bearing capacity of the piles, including the weight of the piles, is estimated to be 10 tons for timber and 22 tons for precast concrete. The stationing referred to herein is shown on the soil profile attached as Sketch 1. Pile capacity curve No. 2 should be utilized from the east end of the proposed pier to the base of the riprap slope (Station 0+35) and pile capacity curve No. 1 should be used at the top of the riprap slope (Station 0+10). Tip elevations for piles driven through the riprap slope, should be interpolated from the two pile capacity curves.

Estimated design tip elevations (BCB) are shown in the following table:

Timber (8" of 7" tip)		Precast Concrete (16" x 16")
Station 0+10 (Curve No. 1)	El. - 18.0	El. - 17.0
Station 0+35 to East End of Pier (Curve No.2)	El. - 38.0	El. - 36.0

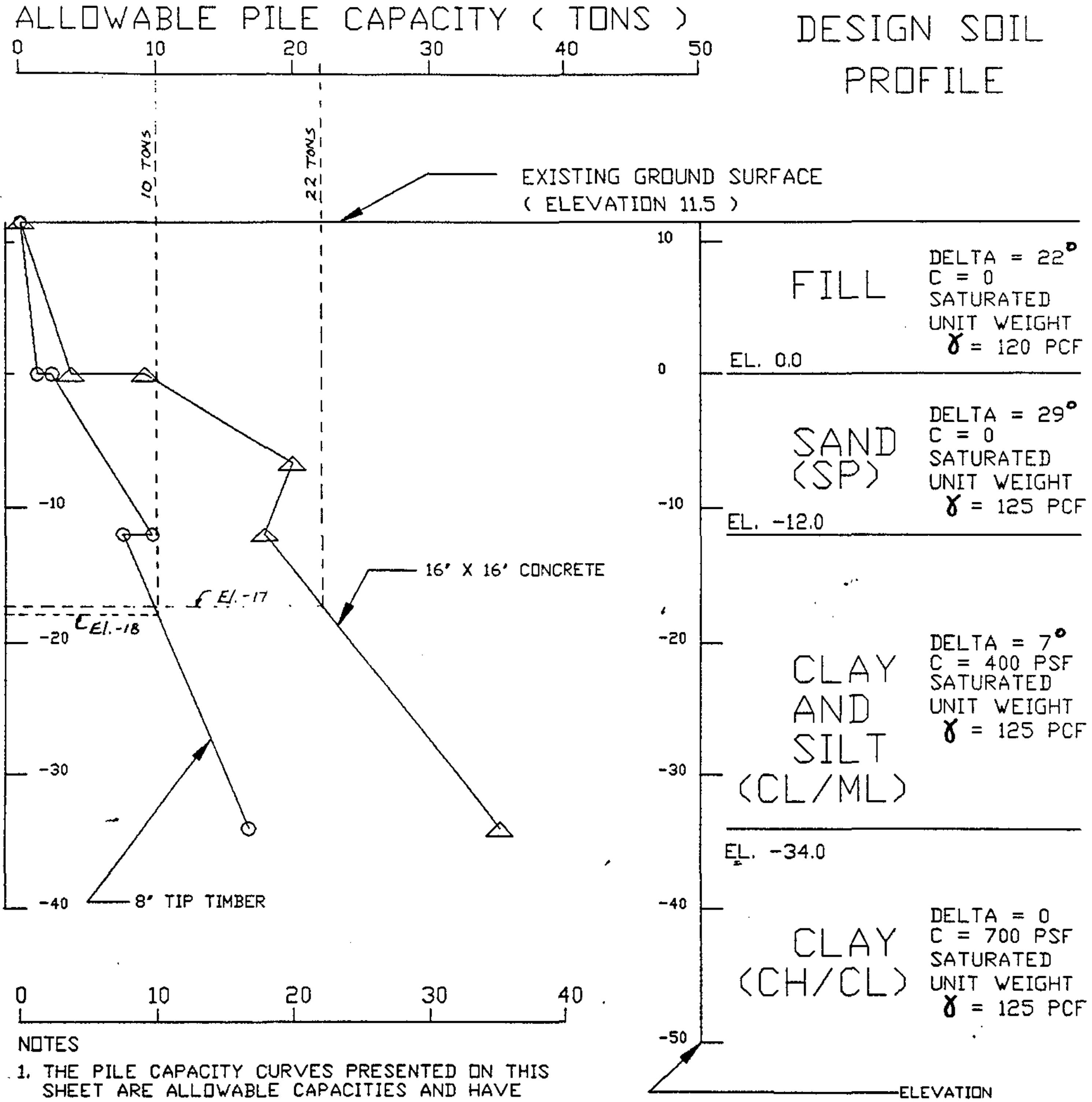
8. Construction Considerations. Dredging for all proposed anchorages in the area of the pier should be completed prior to commencement of pile driving operations. In addition, all existing riprap and bedding stone on the slope at the west end of the proposed pier should be removed by clam shell or drag line and stockpiled on site. Bedding stone and riprap layers should be reconstructed using the salvaged materials immediately following completion of pile driving in this area and prior to construction of the pier superstructure.

Due to the greater weight of the precast concrete piles, larger cranes, pile driving equipment, and floating plant will be required than for timber piles. This increased cost should be considered in the construction cost estimate, and may be offset by the reduced number of concrete piles required.



ELEVATION IN FEET B.C.B.
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
0+00
0+50
1+00
PARAPET WALL
EL. 16.5
RIPRAP
1.5
1
LOOSE
MISCELLANEOUS FILL
δ=22° C = 0
UNIT WEIGHT
= 120 PCF
EL. 0.0
FD86-1
&
FD86-1A
3
1
APPROX. EXISTING GROUND
FD86-2
PROPOSED DREDGE LINE
LOOSE TO DENSE
SAND, δ=29°, C=0, UNIT WEIGHT =
125 PCF
STIFF CLAYS AND SILTS WITH SAND LENSES
δ=7°, C = 400 PSF, SATURATED UNIT WEIGHT =
125 PCF
STIFF CLAY
δ=0 , C = 700 PSF, SATURATED UNIT WEIGHT =
125 PCF
STIFF TO VERY STIFF CLAY
δ=0 , C = 700 PSF, SATURATED UNIT WEIGHT =
125 PCF
DENSE TO VERY DENSE SANDY TILL
δ=34°, C = 0, SATURATED UNIT WEIGHT =
140 PCF
BEDROCK
(CAMBRIDGE ARGILLITE)
LEGEND
FD86-2 BORING DESIGNATION
UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL
BLOWS PER FOOT WITH STANDARD PENETRATION TEST
DATUM:
BOSTON CITY BASE (B.C.B.)
El. 0.0 B.C.B. = El. -5.65 N.G.V.D.
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
R.C.M.
DES. BY
R.C.M.
DR. BY
T.L.B.
CK. BY
JOHN F. KENNEDY MEMORIAL LIBRARY
SUBSURFACE GEOLOGIC PROFILE
ALONG PROPOSED PIER
DORCHESTER MASS.
GEOTECH. ENG. BR.
SKETCH NO. 1
SCALE: 1" = 10'
DATE: FEB. 1987

DESIGN SOIL PROFILE



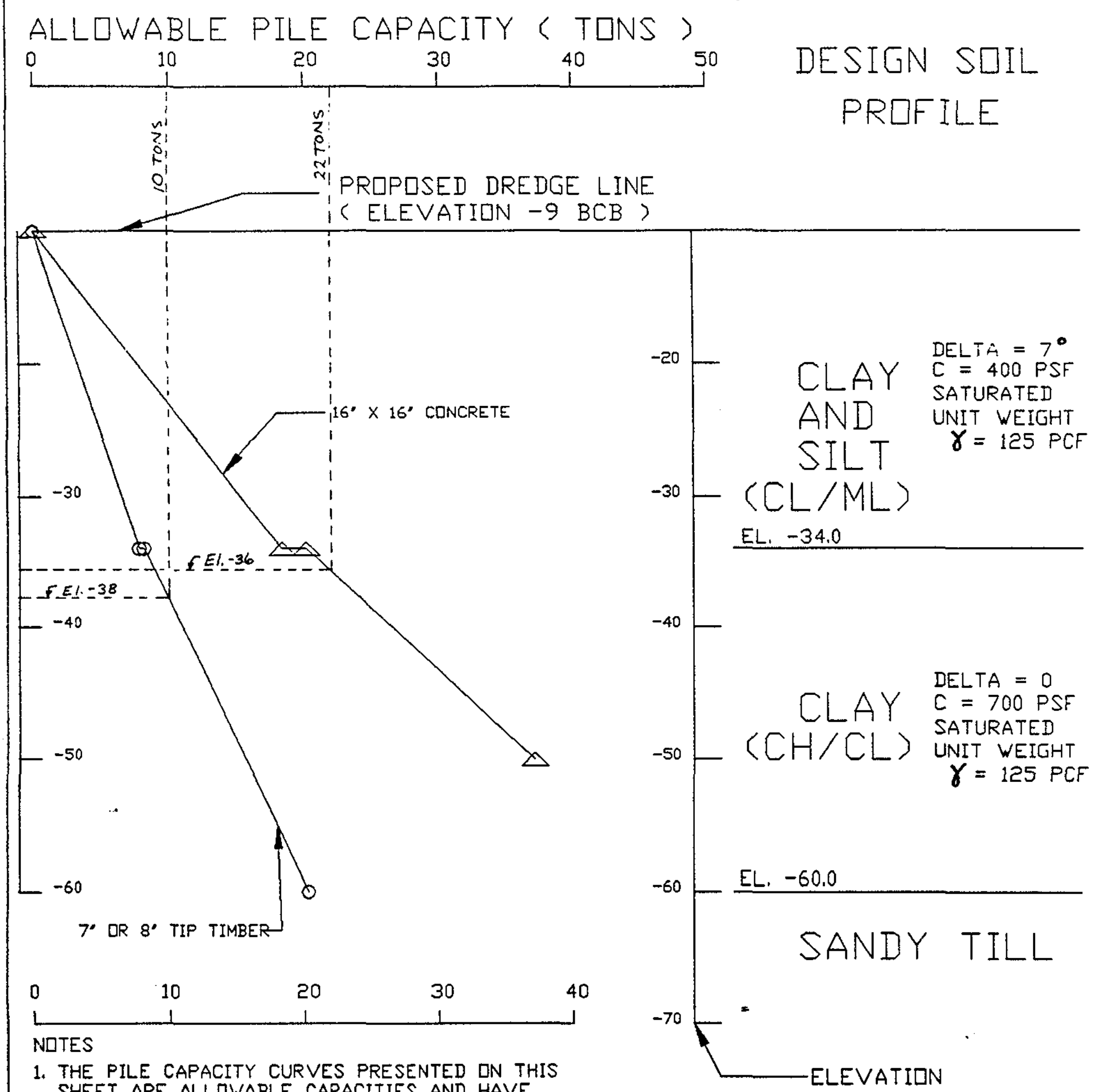
NOTES

1. THE PILE CAPACITY CURVES PRESENTED ON THIS SHEET ARE ALLOWABLE CAPACITIES AND HAVE ALREADY HAD A FACTOR OF SAFETY APPLIED TO THE COMPRESSIVE CAPACITIES SHOWN.
2. THIS CURVE IS TO BE USED TO DETERMINE PILE TIP ELEVATIONS AT THE TOP OF THE RIPRAP SLOPE.
3. ELEVATIONS SHOWN ARE REFERENCED TO BOSTON CITY BASE DATUM.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

R.C.M. DES. BY	JOHN F. KENNEDY MEMORIAL LIBRARY
R.C.M. DR. BY	FOUNDATION FOR PROPOSED PIER
T.L.B. CK. BY	PILE CAPACITY CURVE #1
	DORCHESTER MASS.

GEOTECH. ENG. BR. SCALE: AS SHOWN
SK. NO. 2 DATE: DEC., 1986



NOTES

1. THE PILE CAPACITY CURVES PRESENTED ON THIS SHEET ARE ALLOWABLE CAPACITIES AND HAVE ALREADY HAD A FACTOR OF SAFETY APPLIED TO THE COMPRESSIVE CAPACITIES SHOWN.
2. THIS CURVE IS TO BE USED TO DETERMINE THE PILE TIP ELEVATIONS FROM STATION 0+35 TO THE EAST END OF THE PROPOSED PIER.
3. ELEVATIONS SHOWN ARE REFERENCED TO THE BOSTON CITY BASE DATUM.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

R.C.M. DES. BY	JOHN F. KENNEDY MEMORIAL LIBRARY
R.C.M. DR. BY	FOUNDATION FOR PROPOSED PIER
T.L.B. CK. BY	PILE CAPACITY CURVE #2
	DORCHESTER MASS.

GEOTECH. ENG. BR. SCALE: AS SHOWN
SK. NO. 3 DATE: FEB., 1987

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. #0017

Site JFK Library, Boston MA

Page 1 of 5 Pages

Hole No. FD86-1 Diam. (Casing) 3"

Boring Started 10/16/86

Co-ordinates: see sketch

Boring Completed 10/16/86

Drilled by Todd, Saarinen and Boyer

Report Submitted

Purpose of Exploration determine foundation conditions for the design of pilings for a new pier

Elevation Top of Hole +0.5 ~~M.S.L.~~ B.C.B.*

Total Overburden Drilled 31.8 Feet

Elevation Top of Rock — ~~M.S.L.~~ B.C.B.

Elevation Bottom of Hole -31.3 ~~M.S.L.~~ B.C.B.

Total Rock Drilled 0 Feet

Total Depth of Hole 31.8 Feet

Core Recovered — %

Core Recovered — Ft.: — Diam. — In.

Soil Samples 1 3/8 In. Diam. 8 No.

Soil Samples — In. Diam. — No.

Casing Left in Place 0 Feet

* Boston City Base Datum

Water Table Depth sea level

ELEVATION, B.C.B. ~~Depth~~ From	To	Method of Drilling and Type of Bit Used
0.5	-29.3	Spin 3" casing washing out where necessary with 2 15/16" OD roller bit
-29.3	-31.3	1 3/8" ID split spoon sampler

INDEX

Ground Water	~~Back of~~ Page —
Boring Location Sketch	~~Back of~~ Page 5
Overburden Record	Page 2
Rock Drilling	Page —

Prepared by TABeddoe

Field Date

Lab Date

Submitted by Atlantic Testing Labs, Ltd.

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site JFK Library Page 2 of 5 Pages

Boring No. FDBL-1 Desig. B Diam. (Casing) 3"

Co-ordinates: N see boring E location plan

Elevation Top of Boring	+0.5 B.C.B.	Hammer Wt.	140#
Total Overburden Drilled	31.8 Feet	Hammer Drop	30"
Elevation Top of Rock	— B.C.B.	Casing Left	0'
Total Rock Drilled	0 Feet	Subsurface Water Data	— Page —
Elevation Bottom of Boring	-31.3 B.C.B.	Obs. Well	No
Total Depth of Boring	31.8 Feet	Drilled By	Todd Saarinen and Bayer
Core Recovered	— % No. Boxes —	Mfg. Des. Drill	skid-mounted CME 45
Core Recovered	— Ft : — Diam. — In.	Inspected By:	TABeddoe
Soil Samples	1 3/8 In. Diam. 8 No.	Classification By:	TABeddoe
Soil Samples	— In. Diam. — No.	Classification By:	

Boring Started 10/16/86 Boring Completed 10/16/86

ELEVATION	DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	REC	BLOWS PER 6"	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
1.0 / 0.5						Note top of ground is at 0.5' elevation, Boston City Base	
-1.5		S-1	1 3/8"	30%	4, 2, 3, 4	Sample using 1 3/8" ID split spoon sampler driven by a 140# hammer dropped 30"	Black cmf SAND, some cf GRAVEL, little SILT, trace shell fragments (sat, nonplastic) SP loose
-5.7						Spin 3" casing to next sampling interval.	
-7.7		S-2	1 3/8"	80%	12, 19, 15, 17	Sample	Light brown f SAND, trace SILT (sat, non-plastic) loose SP
-9.0						Spin Casing. Wash out casing using 2 15/16" OD roller bit.	

GENERAL REMARKS:
elevations were surveyed in, using Boston City Base as the datum.

Site: JFK Library

Boring No. FD86-1

Elev.	Depth	Core/Sample No.	Size	Rec	Blows per 6"	6" Sampling and Coring Operations	Classification of Materials
-9.0	0.0'					Spin 3" casing to next sampling interval. Wash out using 2 15/16" OD roller bit.	
-11.1		S-3	1 3/8"	100%	6 6 6 8	Sample using 1 3/8" ID split spoon sampler	Med. grey-green CLAY and SILT, trace f. SAND (sat., plastic) loose CL
-13.1						Spin Casing Wash Out	
-14.8		S-4B S-4A S-4B	1 3/8"	100%	12 16 15 9	Sample	-14.8 to -15.2 soils similar to S-3 CL (S-4B) -15.2 to -16.7 soils similar to S-2 SP (S-4A) -16.7 to -16.8 soils similar to S-3 CL (S-4B)
-16.8						Spin Casing	
-18.8		S-5	1 3/8"	100%	4 5 6 4	Sample	Soils similar to S-3 with a 2" seam of soils similar to S-2 (SP) CL
-20.8						Spin Casing Wash Out	
-25.3		S-6	1 3/8"	100%	WOR/6"	Sample	CL - see description, next page

58A(Test)

Boring No. FD86-1

Site: JFK Library	Boring No. FD86-1	Page 4 of 5

ELEVATION	0 2'	CORE/SAMPLE NO	SIZE	REC	BLOWS PER 6"	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
-27.3		S-6	$1\frac{3}{8}$"	100%	5 5 5		Soils similar to S-3, some SILT with 1" seam of soils similar to S-2 (SP) CL
-29.3						Spin 3" casing to next sampling interval	
-31.3		S-7	$1\frac{3}{8}$"	100%	8 8 9 9	Sample using 1 3/8" ID split spoon sampler end of explorations 10/16/86	Soils similar to S-6 CL (no seams of SP)
						Boring was abandoned and relocated 8 ft toward the sea 10/20/86 after a severe storm broke the casing at the surface. For continuation see log for FD86-1-A.	

(Test)

Boring No FD86-1

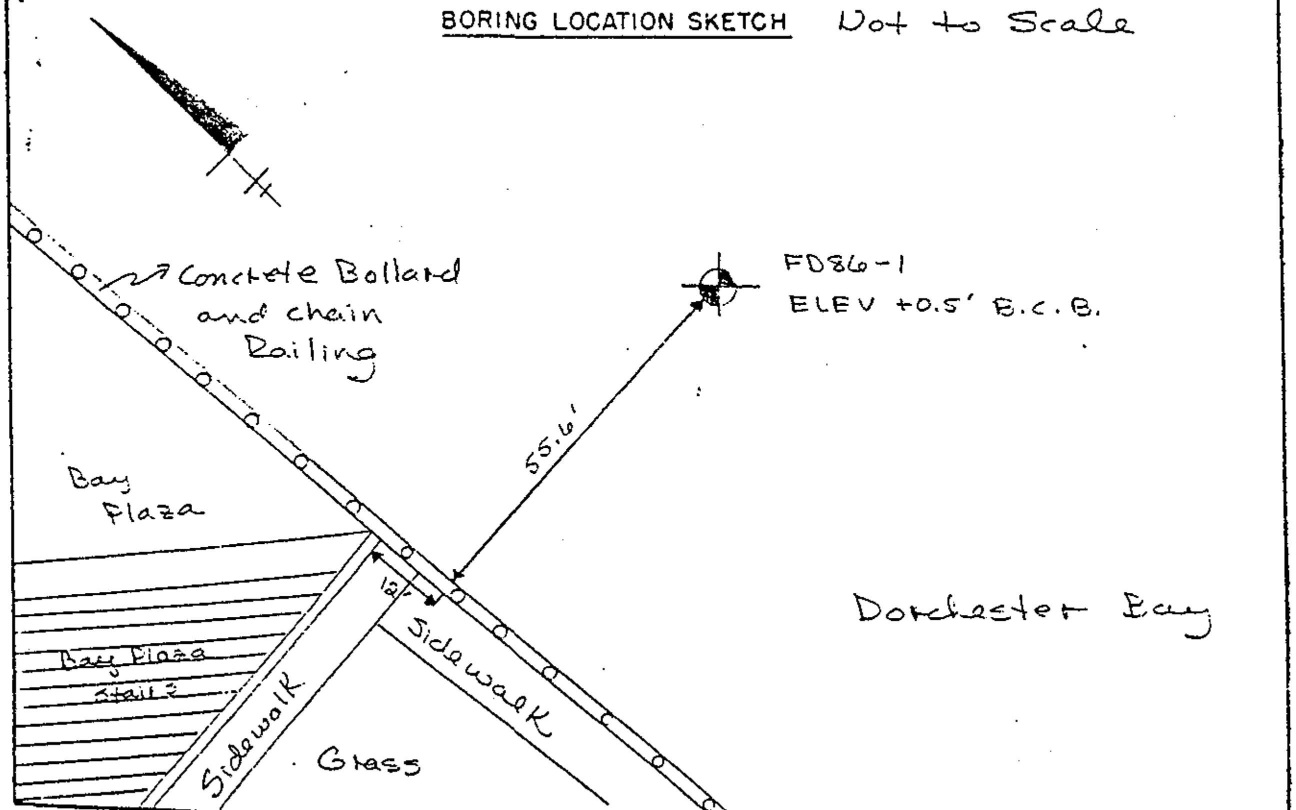
Site: JFK Library
Boring No: FD86-1

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS

Note: Depths are in feet below original ground

BORING LOCATION SKETCH Not to Scale



FORM 59(Test)

Boring No. FD86-1

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O.#0017

Site JFK Library, Boston MA

Page 1 of 7 Pages

Hole No. FD86-1A Diam. (Casing) 3"

Boring Started 10/20/86

Co-ordinates: X see X sketch

Boring Completed 10/24/86

Drilled by Todd + Soarisen

Report Submitted

Purpose of Exploration determine foundation conditions for the design of pilings for a new pier

Elevation Top of Hole +0.5 B.C.B.* ~~M.S.L.~~

Casing Left in Place 0 Feet

Total Overburden Drilled 82.5 Feet

Elevation Top of Rock -82.0 B.C.B. ~~M.S.L.~~

Elevation Bottom of Hole -86.5 B.C.B ~~M.S.L.~~

Total Rock Drilled 4.5 Feet

Total Depth of Hole 87.0 Feet

*Boston City Base Datum

Core Recovered 96 %

Core Recovered 3.83 Ft.: ____ Diam. 2 1/8 In.

Soil Samples 1 3/8 In. Diam. 10 No.

Soil Samples ____ In. Diam. ____ No.

Water Table Depth sea level

ELEVATION, BC.B. ~~Depth~~ From	To	Method of Drilling and Type of Bit Used
0.5	-33.8	Spinning 3" casing
-33.8	-63.0	2 15/16" OD roller bit, open hole
-63.0	-82.5	2 15/16" OD roller bit, spinning 3" casing when needed
-82.5	-86.5	NX diamond coring using water

INDEX

Prepared by TBeddoe

Field Data

Lab. Data

Submitted by Atlantic Testing labs, Ltd.

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	Site JFK Library	Page 2 of 7 Pages
FIELD LOG OF TEST BORING	Boring No. FD86-1-A Desig. B	Diam. (Casing) 3"
	Co-ordinates: N see boring	E location plan

Elevation Top of Boring	+0.5	B.C.B. ~~M.S.L.~~	Hammer Wt. 140#	Boring Started	10/20/86
Total Overburden Drilled	82.5	Feet	Hammer Drop 30"		
Elevation Top of Rock	-82.0	B.C.B. ~~M.S.L.~~	Casing Left 0'	Boring Completed	10/24/86
Total Rock Drilled	4.5	Feet	Subsurface Water Data:	Page	
Elevation Bottom of Boring	-86.5	B.C.B. ~~M.S.L.~~	Obs. Well no		
Total Depth of Boring	87.0	Feet	Drilled By	Todd & Soothner	
Core Recovered 96 %	No. Boxes		Mfg. Des. Drill	skid-mounted CME45	
Core Recovered 3.85 Ft:	Diam. 2 1/8 In.		Inspected By:	Beddoe	
Soil Samples 1 3/8 In. Diam.	10 No.		Classification By:	Beddoe	
Soil Samples In. Diam.	No.		Classification By:		

ELEVATION ~~DEPTH~~		CORE/SAMPLE			BLOWS PER ~~FT.~~ 6" / CORE REC'Y	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
1.0	1" = 2'	NO.	SIZE	DEPTH RANGE / REC			
0.5						Note top of ground is at 0.5' elevation, Boston City Base	
-33.8						Spin 3" casing to next sampling interval (-33.8) from surface	See Field Log for FD86-1 for Material Description
-35.8		S-8	1 3/8"	100%	6 3 4 6	Sample using 1 3/8" ID split spoon sampler	Medium grey CLAY, little SILT, trace f SAND (sat., plastic) loose CH
-40.5						Drill to next sampling interval using 2 15/16" OD roller bit.	
		S-9	1 3/8"	100%	7	Sample	Similar Soils CH

GENERAL REMARKS:

elevations were surveyed in, using Boston City Base as the datum.

continuation of FD86-1, 2 ft seaward.

58(Test)

Site JFK Library	Boring No. FD86-1-A	Page 3 of 7

Elevation	Depth	Core/Sample No	Size	Rec	Blows per 6"	6" Sampling and Coring Operations	Classification of Materials
		S-9	1 3/8"	100%	8 7 10	Sample using 1 3/8" ID split spoon sampler. end of explorations 10/20/86	Similar Soils - CH
-43.2						start of explorations 10/21/86 Drill to next sampling interval using 2 15/16" OD roller bit	
-45.5		S-10	1 3/8"	100%	7 7 8 8	Sample	Grey CLAY, some SILT, trace f. SAND (sat., plastic) loose CL
-47.5						Drill to next sampling interval	
-51.7		S-11	1 3/8"	100%	8 7 8 9	Sample	Similar Soils - CL
-53.7						Drill	
-57.7		S-12	1 3/8"	100%	6	Sample	Similar Soils - CL

A(Test)

Boring No FD86-1-A

Site. JFK Library	Boring No. FD86-1-A	Page 4 of 7

ELEVATION	1" = 2'	CORE/SAMPLE NO	SIZE	DEPTH RANGE / REC	BLOWS PER 6" / CORE REC'Y	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
-59.7		S-12	$1\frac{3}{8}$"	REC 100%	6 8 8 8	Sample using 1 3/8" ID split spoon sampler	Similar soils - CL
-60.7						Drill to next sampling interval using 2 15/16" OD roller bit.	
-63.0							Note change in material consistency during drilling at -60.7. Harder layer penetrated, into clay again until approximately -62.5'
-64.0		S-13A	$1\frac{3}{8}$"	100%	49 38	Sample	Grey f SAND, some SILT, trace CLAY (sat., very slightly plastic) dense SP
-65.0		S-13B			48 53	end of explorations 10/21/86	Grey mf SAND, trace cf GRAVEL, trace SILT (sat., nonplastic) dense SP.
-68.5						start of explorations 10/22/86 Drill end of explorations 10/22/86	Note: these SP layers contain water under confined or semiconfined conditions. Water bubbles up freely through rod and casing.
-70.5		S-14	$1\frac{3}{8}$"	75%	14 10 19 20	start of explorations 10/23/86 Advance 3" casing to next sampling interval by spinning. Sample	Med. grey cmf SAND, little SILT, trace cf GRAVEL, trace CLAY (sat., very slightly plastic) loose SP
-75.0						Spin casing	

Site JFK Library	Boring No. FD86-1-A	Page 5 of 7

Elevation -75.0'	-.2'	Core/Sample No	Size	Rec	Blows per 6"	6" Sampling and Coring Operations	Classification of Materials
-76.5						Spin 3" casing to next sampling interval. end of explorations 10/23/86	
-78.5		S-15	1 3/8"	20%	22 27 24 29	start of explorations 10/24/86 Wash out using 2 15/16" OD roller bit. Sample using 1 3/8" ID split spoon sampler	Med. grey brown cmf SAND, trace SILT, trace cf GRAVEL (sat., nonplastic) mod. dense SF
-80.0						Wash out with roller bit. Spin casing.	
-81.5							Note change in material consistency at about -80.0'
-82.0		S-16	1 3/8"	50%	145	Sample	Med. brown grey cf GRAVEL trace cmf SAND, trace SILT (sat., nonpl) dense GP
-82.5						Drill using 2 15/16" OD roller bit to -82.5', noting slow, difficult drilling	
-86.5		R-1	2 1/8"	96% (46")		Core with NX diamond bit using water, -82.5' to -86.5'.	Run # 1 Grey Limestone Bedrock 7 pieces 4 chips 46" Rec = 96% RQD = 96%
						Boring terminated at -86.5' C.C.B., 10/24/86	

FIELD LOG OF TEST BORING IN ROCK

SITE JFK Library HOLE NO. FD86-1-A PAGE 6 of 7

DATE	DEPTH FT. FROM	DEPTH FT. TO	RUN FT.	RUN REC'V'Y FT.	REC'V'Y %	DRILLING BEHAVIOR FEED	DRILLING BEHAVIOR WATER	DRILLING BEHAVIOR REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
10/24/86	82.5	-86.5	4.0	3.83 (46")	96%	medium	no water loss	end of run	45min	UK diamond	Run #1 drilling was smooth. rock is not a boulder, but good, coherent bedrock. fractures show slight alteration

TOTAL BED ROCK DRILLED 4.0 FEET

TOTAL BED ROCK RECOVERED 3.83 FEET

BED ROCK RECOVERY 96% PERCENT

DRILLER Todd & Saarinen

INSPECTOR Beddoe

NED FORM 130 DEC 63

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

B1-II-15

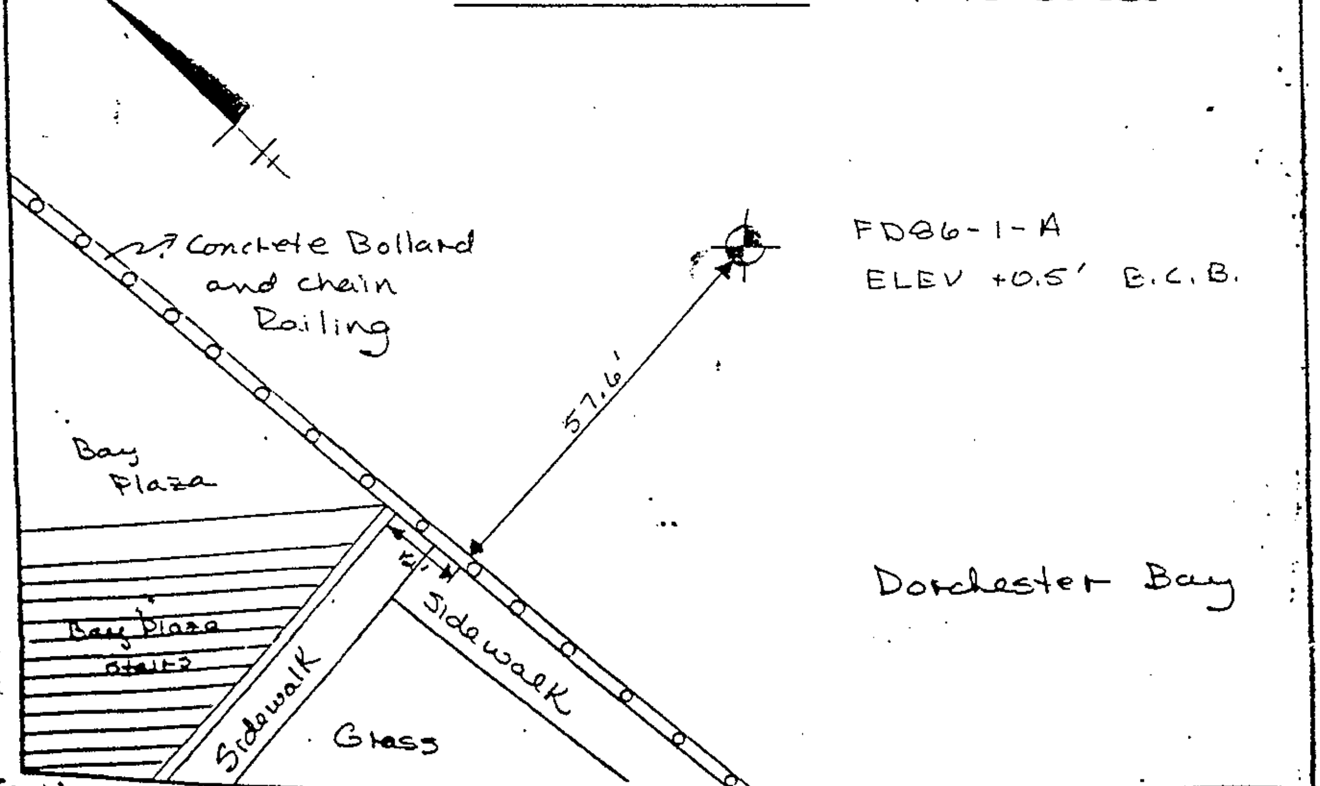
Site: JFK Library
Boring No: FD86-1-A

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS

Note: Depths are in feet below original ground

BORING LOCATION SKETCH Not to Scale



(Test)

Boring No. FD86-1-A

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH
FIELD LOG OF TEST BORING

Site JFK Library, Boston MA PROJECT NO. D.O.# 0017
Page 1 of 7 Pages

Hole No. ED86-2 Diam. (Casing) 3" Boring Started 10/26/86

Co-ordinates: X see X sketch Boring Completed 10/29/86

Drilled by: Todd & Saarinen Report Submitted

Purpose of Exploration determine foundation conditions for the design of pilings for a new pier

Elevation Top of Hole -2.8 ~~M.S.L.~~ B.C.B.*

Total Overburden Drilled 60.1 Feet

Elevation Top of Rock -62.9 ~~M.S.L.~~ B.C.B.

Elevation Bottom of Hole -64.9 ~~M.S.L.~~ B.C.B.

Total Rock Drilled 2.0 Feet

Total Depth of Hole 62.1 Feet

Core Recovered 0 %

Core Recovered 0 Ft.; — Diam. — In.

Soil Samples 1 3/8" In. Diam. 15 No.

Soil Samples — In. Diam. — No.

Casing Left in Place 0 Feet

* Boston City Base Datum

Water Table Depth sea level

~~Depth~~ Elevation From	To	Method of Drilling and Type of Bit Used
-2.8	-59.9	Spin 3" casing using water
-59.9	-64.9	2 5/16" OD roller bit

INDEX

Prepared by Beddoe Field Data Lab. Data

Submitted by Atlantic Testing Labs, Ltd.

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	Site JFK Library, Boston MA Page 1 of 7 Pages
FIELD LOG OF TEST BORING	Boring No. ~~FD86-2~~ Desig. A Diam. (Casing) 3"
	Co-ordinates: X see boring X location plan

Elevation Top of Boring	-2.8 B.C.B.	Hammer Wt.	140#
Total Overburden Drilled	60.1 Feet	Hammer Drop	30"
Elevation Top of Rock	-62.9 B.C.B.	Casing Left	0
Total Rock Drilled	2.0 Feet	Subsurface Water Data	Page
Elevation Bottom of Boring	-64.9 B.C.B.	Obs. Well	none
Total Depth of Boring	62.1 Feet	Drilled By	Todd + Saarinen
Core Recovered	0 % No. Boxes —	Mfg. Des. Drill	Skid-mounted CME 45
Core Recovered	0 Ft : — Diam. — In.	Inspected By:	Beddoe
Soil Samples	1 3/8" In. Diam. 15 No.	Classification By:	Beddoe
Soil Samples	In. Diam. No.	Classification By:	
		Boring Started	10/24/86
		Boring Completed	10/29/86

ELEVATION (~~DEPTH~~) -2	1" = 2'	CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~ REC	BLOWS PER ~~FT.~~ 6" ~~CORE REC'VY~~	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
-2.8						TOP OF BORING, -2.8'	
		S-1A	1 3/8"	65%	WOH/1'	Sample using 1 3/8" ID Split Spoon Sampler	Dark grey SILT and m-f SAND, trace CLAY (sat., v. slightly plastic) loose ML
		S-1B			7 8		
-4.8						Spin 3" casing to next sampling interval	Med. grey-brown f. SAND, trace SILT (sat., non-plastic) loose SP
-5.9		S-2	1 3/8"	100%	5 6 7 8	Sample	Med. grey SILT, some f. SAND (sat., nonplastic) ML with many seams of f. SAND, trace SILT SP
-7.9						Spin casing	
-12.0							

GENERAL REMARKS:
Elevations were surveyed in, using Boston City Base as the datum.

Site: JFK Library	Boring No. FD86-2	Page 3 of 7

ELEVATION	21	CORE/SAMPLE NO	SIZE	REC	BLOWS PER 6" / CORE RECOVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
-12.0							
-12.0		S-3	$1\frac{3}{8}$"	100%	4 4 5 7	Sample using 1 3/8" ID Split Spoon Sampler	Med. grey SILT, little f. SAND, trace CLAY (sat. v. slightly plastic) loose ML
-14.0						Spin 3" casing to next Sampling interval	
-17.3		S-4	$1\frac{3}{8}$"	100%	5 6 6 7	Sample	Med. grey CLAY, little SILT, trace f. SAND (sat, plastic) loose CH
-19.3						Spin Casing	
-21.1		S-5A	$1\frac{3}{8}$"	100%	WOR 7 6 6	Sample	Med grey SILT, some CLAY, trace f. SAND (sat, moderately plastic) loose MH
-23.1		S-5B				Spin Casing	Med grey f. SAND, little SILT, trace CLAY (sat., v. slightly plastic) loose SP (Note water under confined conditions)
-25.6		S-6	$1\frac{3}{8}$"	100%	WOR 5 6 5	Sample	Med grey SILT, little CLAY, trace f. SAND (sat., slightly plastic) loose ML
-27.6						Explorations terminated 10/26/86 Explorations continued 10/27/86 Spin Casing	
-29.0							

BA(Test)

Site JFK Library

Boring No. FD86-2

Page 4 of 7

ELEVATION / Depth	2'	Core/Sample No.	Size	% Rec	Blows per 6" / Core Rec	6" Sampling and Coring Operations	Classification of Materials
-29.0							
-31.2				REC		Spin 3" casing to next sampling interval	
-33.2		S-7	1 3/8"	100%	WOR/1' 8 10	Sample using 13/8" ID split spoon sampler	Grey CLAY, little SILT, trace f. SAND (saturated, plastic) loose CH
-36.1						Spin casing	
-33.1		S-8	1 3/8"	100%	WOR 4 6 6	Sample	Similar Soils CH
-40.7						Spin Casing	
-42.7		S-9	1 3/8"	100%	WOR 5 7 6	sample f.	Grey CLAY, some SILT, trace f SAND (saturated plastic) loose CL
-44.5						Spin casing	
-46.0		S-10	1 3/2"	100%	WOR/1' 5	Sample	Similar Soils CL

3A(Test)

Site: JFK Library

Boring No: FD86-2

Page 5 of 7

Depth	2'	Core/Sample No	Size	REC	Blows per 6"	6" Sampling and Coring Operations	Classification of Materials
[illegible]							
[illegible]		S-10	1 3/8"	100%	7	Sample using 1 3/8" ID split spoon sampler Spin 3" casing to next sampling interval	Similar Soils - CL
-49.7		S-11	1 3/8"	100%	WOR 3 5 5	Sample	Grey CLAY, and SILT, trace f. SAND (sat., plastic) loose CL
-51.7						Spin Casing	
-54.4		S-12	1 3/8"	100%	WOR 5 5 6	Sample	Similar Soils - CL
-56.4						Spin Casing	
-59.9							Note change in material consistency during drilling
		S-13	1 3/8"	90%	11 13 17 14	Sample - first attempt yeilded no recovery, second attempt at same elevation yeilded bouncing refusal at bottom of sample.	Grey c-mf SAND, some SILT, trace f. GRAVEL (sat, non plastic) loose SP
-61.9						Explorations terminated 10/28/86 Explorations continued 10/29/86 Drill using 2 15/16" OD roller bit.	TILL (note rock chips in bottom of spoon)
-63.0							Note change - next page

BA(Test)

Boring No FD86-2

Site: JFK Library						Boring No FD86-2		Page 6 of 7
ELEVATION		CORE/SAMPLE			BLOWS PER 6"	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS	
	2'	NO	SIZE	DEPTH RANGE	CORE REC.			
				REC		attempt NX diamond coring of bedrock, but bent casing (at surface of ground) ruined diamond bit. Continue drilling with roller bit. ..	@ 62.9' note change in material consistency during drilling - probable bedrock. Behavior during drilling indicates good quality, Coherant, Bedrock.	
-64.9						Boring Terminated at -64.9 10/29/86		

A(Test)

Boring No FD86-2

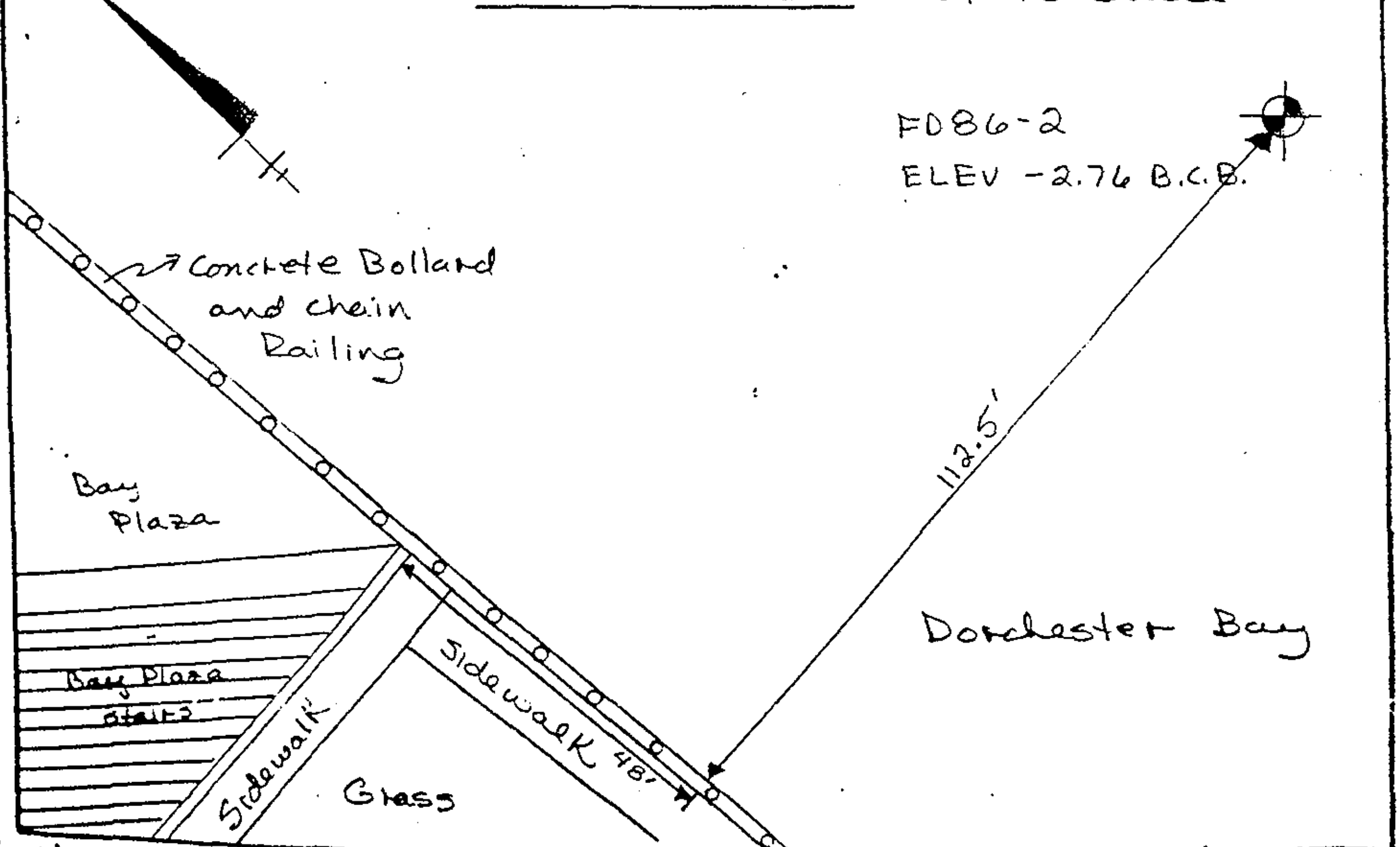
Site: JFK Library
Boring No: FD86-2

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS

Note: Depths are in feet below original ground

BORING LOCATION SKETCH Not to Scale



NAVIGATION IMPROVEMENT REPORT

JOHN F. KENNEDY LIBRARY PIER

SECTION B - PART 2

ACCESS CHANNEL AND TURNING BASIN DESIGN

AND DREDGING COST ESTIMATES

SECTION B - PART 2
ACCESS CHANNEL AND TURNING BASIN
DESIGN AND COST ESTIMATES

DESCRIPTION OF THE PROJECT AREA

The area considered for dredging at both the Library (north) and Pumphouse (south) sites is a shallow subtidal area extending out from the existing riprapped Columbia Point shoreline. Historically the "Cow Pasture" of Columbia Point was located about 700 yards further back towards the mainland. The pasture was surrounded by tidal saltmarsh and mudflats remnants of which exist to the north of the present point. Progressive diking and filling has all but eliminated the intertidal lands. The most recent diking and filling was carried out as site preparation for the Library.

A Hydrographic survey was carried out in January 1986 and is shown as Plates 7, 8 and 9 of this section. The survey shows depths of generally -2 feet MLW and -5 feet MLW at the base of the present riprap dike at the pumphouse and library sites, respectively. This subtidal area slopes gently out to the -6 to -7 foot MLW depth about 400 to 700 yards out from the present shore at the Pumphouse and Library sites, respectively. At this point a much steeper drop to the -12 to -15 foot MLW level is encountered prior to reaching the Federal Dorchester Bay Channel limit.

Historically, a channel had been dredged from deep water in Dorchester Bay to the area of the Pumphouse where a pier with rail access existed. Various accounts cite the use of this pier for collier offloading and the loading of barges with refuse for shipment to Spectacle Island in Boston Harbor. The pier was removed or buried with fill prior to construction of the Pumphouse The old channel has since silted in to the point where it is practically non-existent. No dredging was ever carried out at the Library site. Dredging at the pumphouse site would therefore likely require removal of greater amounts of sediment deposited during the modern industrial era than would dredging at the Library site.

CHANNEL AND BASIN DESIGN

Channel and basin design dimensions were determined from vessel classes projected by NARA and the University of Massachusetts as likely users of the proposed pier facility. The University projected continual use of the facility by a vessel in the 90-foot range which it intends to acquire to support its marine sciences programs. Water taxis serve to connect waterfront tourist attractions, mass transit terminals and the various harbor islands in the state park system.

Several passenger vessels operate in Boston Harbor as commuter and tour ferries, water taxis and charter passenger boats. The proposed pier would allow the Kennedy Library to be included as a regular stopping point for such tours, thereby connecting the Library with other cultural and educational attractions in the city of Boston. The vessels now commonly in use as passenger ferries range from 70 to 200 feet in length.

The proposed pier and dolphin arrangement would allow continual use of the facility, as required by the University of Massachusetts research vessel. The facility would also allow sufficient dockage to accommodate the largest of the class of passenger ferries now in service. As vessel use would not be frequent enough to require two-way traffic, channel width was designed for one-way passage of the average design vessel only. The average design vessel was determined to be a passenger ferry about 130 feet in length with a beam of 40 feet and draft of 8 feet. It was assumed that passenger vessels would not be in service during storms or periods of heavy seas or wave action. An additional 2 feet was therefore allowed for wave height and vessel pitch, squat and roll. For one-way traffic a channel width of 3 times the design vessel beam, or 120 feet was considered adequate.

Traffic to and from the pier would originate at, or be destined for, points north of Columbia Point in Boston Inner Harbor. A more northeasterly orientation of the Columbia Point access channel from the pier to the Dorchester Bay Channel would allow for easier maneuvering of vessels between the two channels. As nearshore depths tend to increase towards the north, dredging quantities would also be minimized by such an alignment.

Basin depth would be the same -10 feet mlw as that provided by the channel. The basin length would extend along the entire 300 feet of berthing dockage provided by the pier and dolphins and extend a distance of 65 feet to either side, half the length of the design vessel, to provide adequate maneuvering room. Basin width at a minimum would extend seaward two vessel lengths or about 260 feet from the centerline of the row of dolphins to provide adequate maneuvering room for un-assisted vessel turning. The basin limits would flare out to meet the channel over twice this distance. The basin would also extend shoreward of the dolphins to provide berthing and access to the small craft landing.

NATURE OF MATERIAL TO BE REMOVED

In order to determine the nature of material to be removed from each site, tube samples were taken in the basin and channel areas in January 1986. Mechanical sieve analysis was conducted on these samples and the results are included in the Environmental Assessment. The four samples taken from the Pumphouse Site and three samples from the Library Site show the nearshore sediments to be dredged to form the turning basin at either site to be predominantly clayey sand. The channel area sediments further offshore at either site were shown to be organic clay. The two borings conducted at the pier location for the Library site encountered no refusal and therefore, ledge is not expected to be encountered.

DREDGING AND DISPOSAL METHODS

The material proposed to be dredged from the Library Site was found to be acceptable for ocean disposal through a variety of chemical, physical and biological testing procedures. Removal of the material to form the access channel and turning basin would be by bucket dredge. The dredged material would be placed in scows and towed to the Foul Area, about 25 miles to the east, for open water disposal. The Foul Area is the nearest interim approved ocean disposal site and is extensively used for the disposal of dredged material from eastern Massachusetts and New Hampshire harbors. Controlled disposal methods will be used to ensure that the material will be point dumped at the site. A location map for the Foul Area is shown in the Environmental Assessment.

QUANTITY ESTIMATES

Quantity estimates for each of the two sites were developed according to the channel and basin design dimensions described previously. Quantity estimates include a one-foot overdredge allowance to -11 feet MLW and provide for side slopes of 1:3. The quantities to be removed for the Library and Pumphouse Site, respectively were 69,000 and 89,500 cubic yards.

AIDS TO NAVIGATIONS

The United Stated Coast Guard, First District was consulted as to the overall feasibility of the project and requirements for navigation aids. It was determined that 6 new steel can buoys will be required to mark the access channel and turning basin limits. These buoys have an estimated in-place cost of $4,000 each.

COST ESTIMATES

Cost estimates for dredging and disposal were developed for both sites. The construction plant was assumed to include a 5 cubic yard bucket dredge and barge, 2(two) 1,500 cubic yard(cy) dump scows, a 1000HP tug and a 165HP launch. Mobilization and demobilization is expected to take a total of one week and costs for such are included in the unit costs. Construction duration for dredging activities is estimated to be 6 or 8 weeks for the Library or Pumphouse Sites, respectively. The dredging plant would operate in a single 12-hour shift, 6 days a week. Unit prices include the cost of a Corps dredge inspector and 10 percent for contractor profit. Channel and basin cost estimates are shown below.

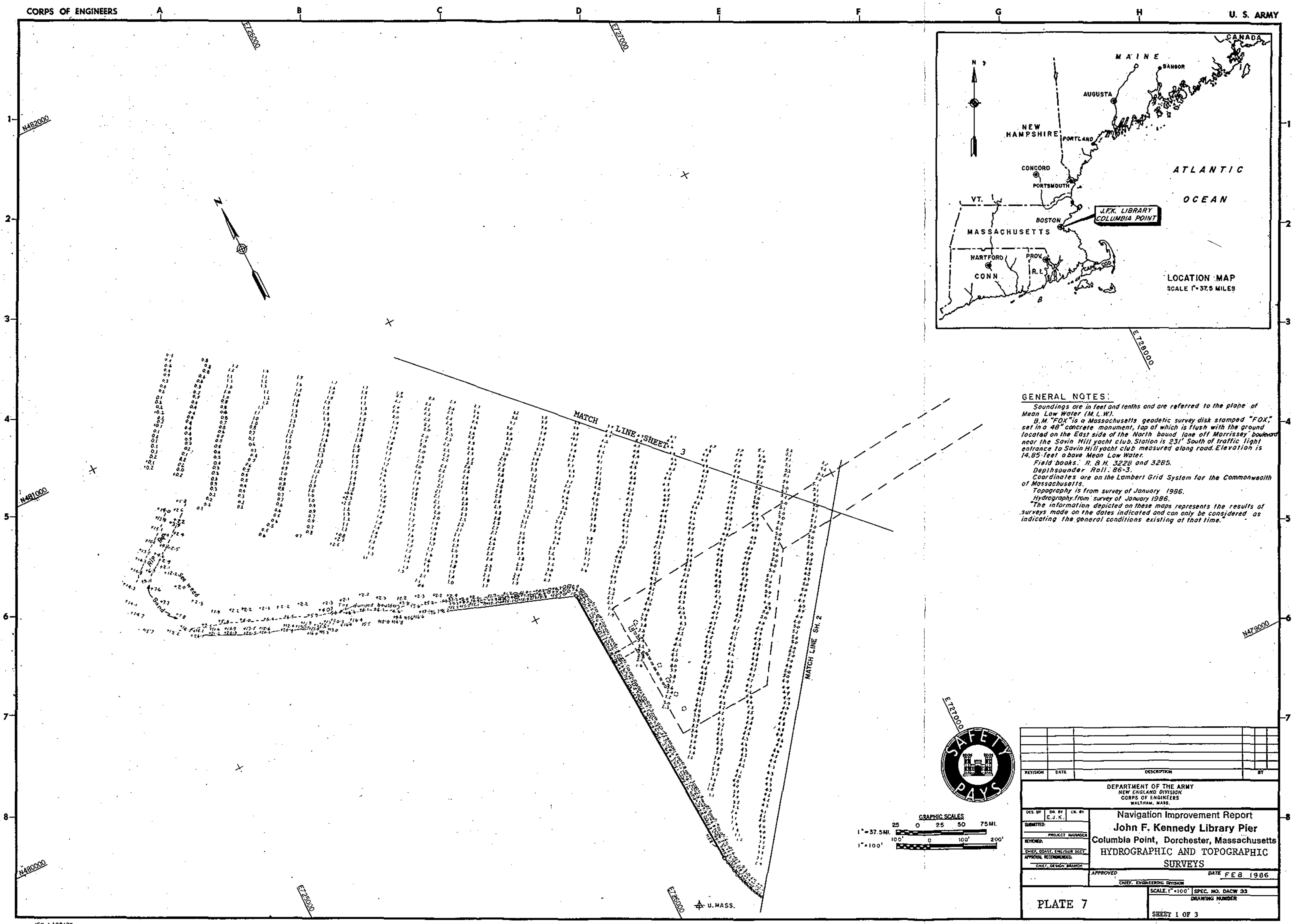
DREDGING COST ESTIMATES

	LIBRARY SITE	PUMPHOUSE SITE
Total cubic yards to be removed	69,000cy	89,500cy
x $8.20/cy	$566,000	$734,000
Contingencies (25%)	142,000	184,000
	$708,000	$918,000
Engineering & Design	25,000	25,000
Supervision & Administration	43,000	44,000
	$776,000	$987,000
Aids to Navigation (6 @ $4,000 each)	24,000	24,000
TOTAL	$800,000	$1,011,000

MAINTENANCE

Maintenance dredging is expected to be required once every 10 years. At an estimated shoaling rate of 3 percent of the original dredging volume annually, a total of about 20,000cy would be removed with each maintenance activity. At present cost each maintenance dredging activity would cost approximately $225,000.

Navigation aids would also require periodic maintenance. Painting and chain replacement would be necessary at two-year intervals.


CORPS OF ENGINEERS
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E725000
E726000
E727000
N482000
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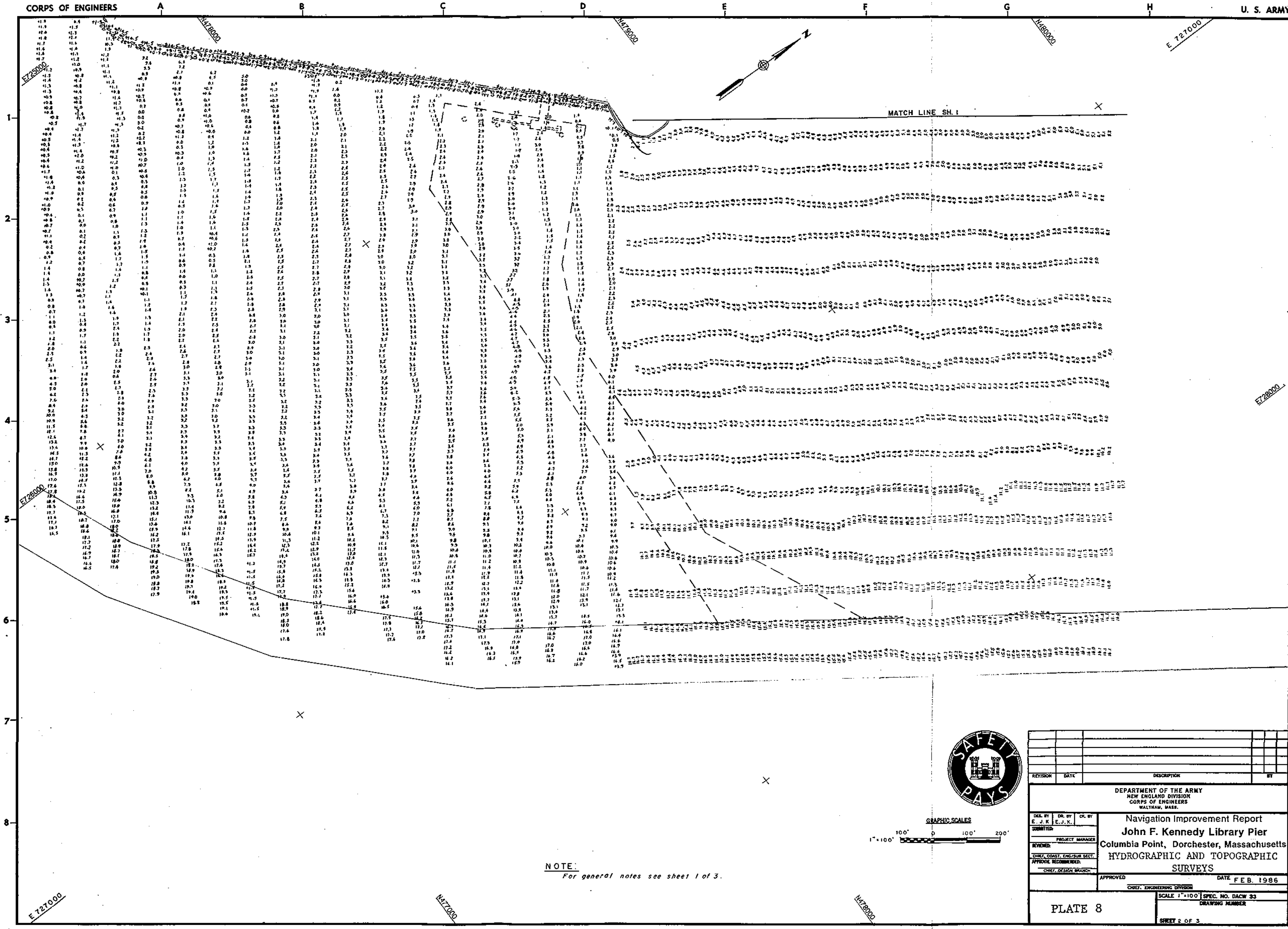
N480000
N479000
N
MATCH LINE SHEET 3
MATCH LINE SH. 2
Rip Rap
Sea weed
Sand
Top Buried boulder
U.MASS.
MAINE
BANGOR
AUGUSTA
CANADA
NEW HAMPSHIRE
PORTLAND
CONCORD
PORTSMOUTH
VT.
BOSTON
MASSACHUSETTS
HARTFORD
PROV.
R.I.
CONN
ATLANTIC
OCEAN
J.F.K. LIBRARY
COLUMBIA POINT
LOCATION MAP
SCALE 1"=37.5 MILES
GENERAL NOTES:
Soundings are in feet and tenths and are referred to the plane of Mean Low Water (M.L.W.).
B.M. "FOX" is a Massachusetts geodetic survey disk stamped "FOX," set in a 48" concrete monument, top of which is flush with the ground located on the East side of the North bound lane off Morrissey boulevard near the Savin Hill yacht club. Station is 231' South of traffic light entrance to Savin Hill yacht club measured along road. Elevation is 14.85 feet above Mean Low Water.
Field books. R. & H. 3228 and 3285.
Depthsounder Roll. 86-3.
Coordinates are on the Lambert Grid System for the Commonwealth of Massachusetts.
Topography is from survey of January 1986.
Hydrography from survey of January 1986.
"The information depicted on these maps represents the results of surveys made on the dates indicated and can only be considered as indicating the general conditions existing at that time."
SAFETY PAYS
GRAPHIC SCALES
1"=37.5MI.
25 0 25 50 75MI.
1"=100'
100' 0 100' 200'
REVISION
DATE
DESCRIPTION
BY
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
DES. BY
DR. BY
E.J.K.
CK. BY
SUBMITTED:
PROJECT MANAGER
REVIEWED:
CHIEF, COAST. ENG/SUR SECT.
APPROVAL RECOMMENDED:
CHIEF, DESIGN BRANCH
Navigation Improvement Report
John F. Kennedy Library Pier
Columbia Point, Dorchester, Massachusetts
HYDROGRAPHIC AND TOPOGRAPHIC
SURVEYS
APPROVED
CHIEF, ENGINEERING DIVISION
DATE FEB 1986
SCALE 1"=100'
SPEC. NO. DACW 33
DRAWING NUMBER
PLATE 7
SHEET 1 OF 3
JFK LIBRARY



CORPS OF ENGINEERS
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N480000
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E725000
E726000
E728000
N477000
MATCH LINE SH. 1
N
GRAPHIC SCALES
1" = 100'
100'
0
100'
200'
NOTE:
For general notes see sheet 1 of 3.
SAFETY PAYS
REVISION
DATE
DESCRIPTION
BY
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
DES. BY E. J. K
DR. BY E.J.K.
CK. BY
SUBMITTED:
PROJECT MANAGER
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CHIEF, COAST. ENG/SUR SECT.
APPROVAL RECOMMENDED:
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Navigation Improvement Report
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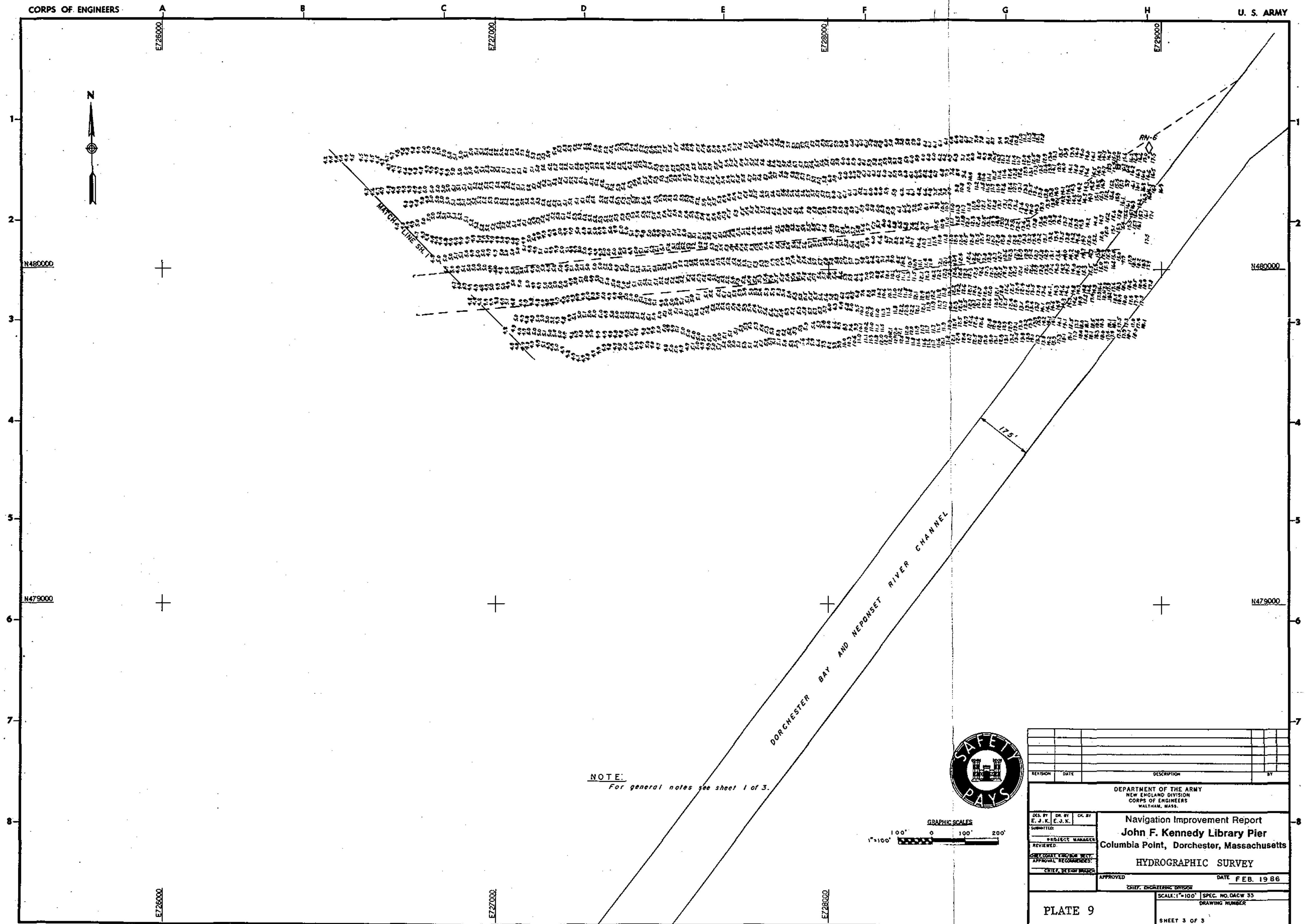
HYDROGRAPHIC AND TOPOGRAPHIC SURVEYS
APPROVED
CHIEF, ENGINEERING DIVISION
DATE FEB. 1986
SCALE 1"=100'
SPEC. NO. DACW 33
DRAWING NUMBER
SHEET 2 OF 3
PLATE 8

JFK LIBRARY


CORPS OF ENGINEERS
U. S. ARMY
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E727000
E728000
E729000
N480000
N479000
N
MATCH LINE SH. 1
RN-6
175'
DORCHESTER BAY AND NEPONSET RIVER CHANNEL
NOTE:
For general notes see sheet 1 of 3.
SAFETY PAYS
GRAPHIC SCALES
1"=100'
100' 0 100' 200'
REVISION
DATE
DESCRIPTION
BY
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
DES. BY E. J. K.
DR. BY E. J. K.
CK. BY
SUBMITTED:
PROJECT MANAGER
REVIEWED:
CHIEF, COAST. ENG./SUR. SECT.
APPROVAL RECOMMENDED:
CHIEF, DESIGN BRANCH
Navigation Improvement Report
John F. Kennedy Library Pier
Columbia Point, Dorchester, Massachusetts
HYDROGRAPHIC SURVEY
APPROVED
CHIEF, ENGINEERING DIVISION
DATE FEB. 1986
SCALE: 1"=100'
SPEC. NO. DACW 33
DRAWING NUMBER
PLATE 9
SHEET 3 OF 3

NAVIGATION IMPROVEMENT REPORT

JOHN F. KENNEDY LIBRARY PIER
COLUMBIA POINT
DORCHESTER, MASSACHUSETTS

SECTION C

VIEWS OF AGENCIES
AND COPIES OF CORRESPONDENCE

PREPARED BY:
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FOR:
NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

LIST OF CORRESPONDENCE

AGENCY	DATE
NATIONAL ARCHIVES	September 30, 1986
NEW ENGLAND DIVISION	September 22, 1986
NEW ENGLAND DIVISION	August 8, 1986
U.S. COAST GUARD	July 28, 1986
U.S. ENVIRONMENTAL PROTECTION AGENCY	July 22, 1986
MASSACHUSETTS HISTORICAL COMMISSION	July 18, 1986
MASSACHUSETTS OFFICE OF COASTAL ZONE MGMT	July 16, 1986
NEW ENGLAND DIVISION	July 8, 1986
NATIONAL MARINE FISHERIES SERVICE	June 18, 1986
NEW ENGLAND DIVISION	June 18, 1986
MASSACHUSETTS HISTORICAL COMMISSION	June 16, 1986
NEW ENGLAND DIVISION	June 25, 1986
NEW ENGLAND DIVISION	June 25, 1986
NATIONAL ARCHIVES	May 22, 1986
NEW ENGLAND DIVISION	May 21, 1986
NEW ENGLAND DIVISION	May 21, 1986
NEW ENGLAND DIVISION	February 28, 1986
NEW ENGLAND DIVISION	September 26, 1985
NATIONAL ARCHIVES	July 23, 1985

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO ATTENTION OF

April 24, 1987

Planning Division
Coastal Development Branch

Mr. James C. Megronigle
Acting Assistant Archivist
for Management and Administration
National Archives and Records Administration
Washington, D.C. 20408

Dear Mr. Megronigle:

I am writing in response to your letter of March 13, 1987 in which you accepted our Phase I report for the John F. Kennedy Library Pier. We are presently preparing cost estimates for Phase II items as requested including detailed design, contracting, construction management and inspection. The minor design changes that have been proposed can be discussed and incorporated during the detailed design process.

One item included in your letter, namely obtaining local, state, and Federal permits and assuring compliance with all applicable laws and regulations is cause for concern. As a Federal action, this project would require permits from the Corps of Engineers and two state regulatory documents, "Water Quality Certification" (WQC) from the MA Department of Environmental Quality Engineering's Division of Water Pollution Control and "Concurrence with a Determination of Federal Consistency" from the MA Office of Coastal Zone Management (CZM) The request for WQC and CZM consistency determination can be prepared and processed by this office. The Commonwealth of Massachusetts, has in recent years, refused to consider requests for these two documents until the necessary local and state licenses and permits have been processed and granted. As a Federal agency, this office cannot apply for or involve itself in the processing of local and state licenses and permits not required by Federal statute. This office can, if you desire, prepare the necessary applications, however, we cannot be signatory to them as preparer or agent.

Prior to preparing a Memorandum of Understanding (MOU) between our two agencies it is requested that we meet at Waltham to discuss the various options concerning Phase II scheduling and the scope of permitting activities. I will be available for a meeting on any of the following dates in May: 4, 6, 11 - 14. We believe this meeting necessary in order to reach a mutual understanding as to the responsibilities and course of action to be detailed in the MOU. Please contact me concerning your availability for this meeting at (617) 647-8220.

Sincerely,

Thomas A. Rhen
Colonel, Corps of Engineers
Division Engineer

National Archives

Washington, DC 20408

March 13, 1987

Colonel Thomas A. Rhen
Department of the Army
Corps of Engineers
Coastal Development Branch
424 Trapelo Road
Waltham, MA 02254-9149

Dear Colonel Rhen:

We have received and reviewed the Corps of Engineers' report on the Phase I tasks completed in connection with the Kennedy Library pier project. We find that the Phase I tasks, as outlined in the report, have been completed satisfactorily, and we accept the report as fulfilling the Corps' obligations under our memorandum of understanding. I understand that the Corps wishes to make some minor changes to the report. After those are made, the report may be considered final and released for public and official review.

We are now prepared to enter into another agreement with the Corps to bring the project to completion. Phase II of the project will consist of design and construction of the pier. If you agree to undertake them, the Corps' tasks will include detailed design, contracting for construction, construction management and inspection, coordination with local, state, and Federal governmental units, including obtaining permits, and assuring compliance with all applicable laws and regulations. We expect to consult with the Corps on minor refinements of design and on materials in preparation for Phase II.

Again, we ask that your office prepare a draft memorandum of understanding covering the necessary tasks, including a cost estimate and a schedule for Phase II. We wish to proceed as quickly as possible and it would be helpful to us if we could have the draft agreement soon.

Thank you for your assistance.

Sincerely,

James C. Megronigle

JAMES C. MEGRONIGLE
Acting Assistant Archivist
for Management and Administration

National Archives

Washington, DC 20408

SEP 30 1986

Col. Thomas A. Rhen
Coastal Development Branch
Corps of Engineers
Department of the Army
424 Trapelo Road
Waltham, MA 02254-9149

Dear Colonel Rhen:

Thank you for your letter of September 22 which notified us of the need for a second bioassay test in connection with the Kennedy Library pier project. We concur with the proposal for a second test and we agree to the extension of the Phase I period to January 3, 1987.

Sincerely,

James C. Megronigle

JAMES C. MEGRONIGLE
Acting Assistant Archivist
for Management and Administration

National Archives and Records Administration

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

September 22, 1986

REPLY TO ATTENTION OF

Planning Division
Coastal Development Branch

Ms. Claudine J. Weiher
Assistant Archivist for
Management & Administration
National Archives & Records Admin.
8th Street & Pennsylvania Avenue, N.W.
Washington, D.C. 20408

Dear Ms. Weiher:

I am writing to request an extension of the completion for our Phase I efforts concerning the proposed J.F. Kennedy Presidential Library Pier.

Our project manager for this study, Mr. Mark Habel recently appraised your Mr. Van Tassel of the problems we are encountering with the bioassay-bioaccumulation testing of the material to be dredged to provide a channel and turning basin for pier access. The original test was conducted in July and August by our contractor, Environmental Resources Co. (ERCO) of Marblehead, Massachusetts. Discrepancies in test procedures resulted in unfavorable test results. Since the material is proposed for Ocean Disposal, favorable test results are critical to the successful completion of our study efforts. Our Environmental Assessment, interagency coordination and state permitting activities cannot be completed without a satisfactory test being conducted.

It will be necessary for us to have a second bioassay test conducted before proceeding further. This second bioassay test will be conducted at no additional cost to the National Archives. In order to conduct the test and complete our Phase I efforts it will be necessary to extend the date for completion by 90 days or until January 3, 1987. Should further testing show the material to be dredged to be unacceptable for ocean disposal, we shall notify your office to discuss additional investigations necessary for securing and assessing an upland disposal site.

As stipulated in Article IX of our Memorandum of understanding, I am requesting your concurrence with the extension of the completion date.

Should you have any questions concerning our request or study efforts, please feel free to contact me at (617) 647-8220. Mr. Habel, may be reached at (617) 647-8550.

Sincerely,

Thomas A. Rhen
Colonel Corps of Engineers
Division Engineer

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO ATTENTION OF

August 8, 1986

Planning Division
Impact Analysis Branch

Mr. Richard Delaney, Director
Coastal Zone Management
The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

Dear Mr. Delaney:

This letter is in response to your office's review comments (16 July 1986) on the preliminary information submitted to Secretary Hoyte regarding a proposed channel dredging and pier construction at the John F. Kennedy Library on Columbia Point. Enclosed are specific comments in response to the concerns raised by your coastal biologist. I would like to restate our need for any environmental information your agency could supply us with.

Importantly, the question of sampling strategy as it relates to consistency review, appears to remain open. We believe the chemical and biological sampling employed allows sound environmental management decision making. If your office disagrees, please inform us immediately.

I thank you for your timely review. If you have any further questions, please contact Mr. William Hubbard (Marine Ecologist) at 647-8236 or Mr. Mark Habel (Project Manager) at 647-8525 of my staff.

Sincerely,

Paul E. Pronovost
for Joseph L. Ignazio
Chief, Planning Division

Enclosure

Reference 16 July 1986 letter from Bradley W. Barr to Col. E. D. Hammond.

1. The two (2) blue-line prints included with our letter diagram the preferred alternative channel configuration and pier/dolphin design. The Pump House Site alternative is not being pursued due to high levels of contaminants in the vicinity of the UMASS balustrade. The sample site locations will be plotted when final consistency determinations are submitted.

2. We feel the levels of contaminants are accurate as reported. This area does have exceedingly high concentrations of various chemicals adsorbed to the sediments. We do not anticipate any additional sampling for bulk chemical or elutriate concentrations before our consistency review. We are currently conducting bioassay/bioaccumulation tests on various locations from the Library Site, to satisfy the Ocean Disposal Criteria. If CZM intends to require additional testing during the consistency review, please inform us now so we may inform our client and take appropriate action.

3. We concur. Bioassay/bioaccumulation tests are ongoing and results will be forwarded when available.

4. The Biological Report included in Appendix II of the document elaborates on the sampling program as summarized in the text, as referenced. Conclusions about species assemblages are not based wholly on this sampling program. The interactions of species assemblages in urban estuarine environments is well documented in scientific literature. The conclusions were based in part on the sampling and additionally on the scientific knowledge of our Environmental Resources Section, the analysis of chemical and physical data, and discussion with scientific colleagues.

   a. The reason for winter sampling was not scientific, but economic. The project schedule did not allow time to delay sampling until the summer. We believe the winter season benthic dominants identified are still characteristic of the community regardless of the season.

   b. The researchers used a 0.5mm sieve for the hand core samples. These samples were statistically analyzed. The 1.0mm sieve was only used in the thirteen (13) 0.04m² grid excavations. These larger samples were only intended to indicate the presence or absence of shellfish concentration areas. The smaller hand cores were used to develop the macrobenthic community structure.

c. We disagree with the rejection of diversity indices as descriptive statistics. The limitations of these indices are delineated and we find them useful in comparing the distribution of observations among categories (individuals among species) as they were intended to be used.

d. We disagree with the description of the sampling program as "probably inadequate for any sufficient description of the indigenous benthic community". As stated above, applied marine ecology relies on the knowledge of the researcher, parallels to academic investigations and descriptions from the naturalists on species biology. We feel our conclusion: "The density of *Mya arenaria* clams at either site is therefore not assumed to be significant" is valid based on our results. We would appreciate any recent clam density data available for populations in the project vicinity.

e. The chemical contamination at the Pump House Site makes it infeasible to pursue as an alternative. Based on the design criteria for the pier, wind fetch differences between the two sites is considered negligible.

In response to the concluding remarks, we believe the chemical and biological sampling allows sound environmental management decision-making. All chemical determinations were made using EPA guidelines. The 0.5mm sieve is the standard used for the NED Disposal Area Monitoring System (DAMOS); and the joint NED-EPA Field Verification Program (FVP); it has been reviewed as adequate for Disposal Site Designation investigations by EPA-ERL at Narragansett, Rhode Island and is the standard of most Corps of Engineers investigations nationwide. This size sieve will be continued to be used by NED scientists. If in the opinion of the Office of Coastal Zone Management, you believe our scientific investigations are inadequate to allow a consistency review, please inform us immediately. Otherwise, we will assume your consistency review can be conducted using our sampling strategy as presented.

U.S. Department
of Transportation
**United States
Coast Guard**

Commander
First Coast Guard District

408 Atlantic Avenue
Boston, MA 02210-2209
Staff Symbol: (oan)
Phone: (617) 223-8338

c/Planning

Info

16500

From: Commander, First Coast Guard District
To: Commanding Officer, U. S. Army Corps of Engineers, Waltham, Massachusetts

Subj: PROPOSED CHANNEL AND PIER CONSTRUCTION AT THE JOHN F. KENNEDY PRESIDENTIAL LIBRARY

Ref: Your letter of July 8, 1986

1. The Coast Guard has no objection to the proposed project.

2. Please notify this office a minimum of 12 weeks in advance to ensure proper advertising in the Local Notice to Mariners of the pending operations.

3. The establishment of six buoys will be required to properly mark the newly dredged channel, therefore the importance of timely notification for proper advertising cannot be over-emphasized. Notify this office 8 weeks prior to project completion.

4. If you require additional information please feel free to contact me or Mr. Robert Potkay of this staff.

C. M. MONTANESE, JR.
By direction

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

July 22, 1986

Joseph L. Ignazio, Chief
Planning Division
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02254-9149

RE: Channel and Pier Construction
JFK Presidential Library
Boston Harbor

Dear Mr. Ignazio:

Thank you for your letter dated June 25, 1986, initiating coordination on a proposed channel and pier construction project at the John F. Kennedy Presidential Library in Boston Harbor, Massachusetts.

Based on the information submitted, we are unable to identify the exact location of the proposed project, or the location of the sediment and water quality test stations. We assume that the figures referenced in the preliminary draft environmental assessment (EA) will indicate the project location and configuration when they are published with the Draft EA. In the meantime, sufficient site information is not available to enable us to fully assess the two alternatives, "Library Site" and "Pump House Site".

The proposed Pump House Site may have previously been the subject of a Corps permit application by Massachusetts Department of Environmental Management (DEM), Division of Waterways Number 25-84-607 MEPA EOEA Number 5267, which in our opinion failed to pass the ocean dumping criteria due to accumulation of polychlorinated biphenyls (PCBs) in test organisms. The data contained in your preliminary draft document indicate the presence of substantial concentrations of contaminants at the Pump House Site - Stations A-D, including PCBs up to 5.6 parts per million (ppm). The Library Site appears to contain lower amounts of contaminants. However, one test site (Site E) contains .93 ppm PCBs. We recommend that the location of the DEM project be identified, and if it is in the area of the proposed project, the previous test results (sediment, biological and chemical) should be included in the Draft EA to supplement the existing data base.

Bioassay/Bioaccumulation analyses must be performed on the proposed dredged material and documented in the Draft EA. We are surprised that no bioassay/bioaccumulation analyses were performed on samples of the approximately 70,000 cubic yards of material proposed to be dredged. Based on the high level of PCBs in the project area, (particularly the Pump House Site), and the previous test results indicating accumulation of PCBs in test organisms from the project area, we believe the proposed disposal of dredged material at the Foul Area may not comply with the Ocean Dumping Act and London Ocean Dumping Convention. We request that the Corps re-examine the disposal alternatives, and explore additional upland disposal sites.

Finally, we request that your Impact Analysis Branch contact Donald Cooke of my staff at 617/223-1739 so that we may schedule a meeting to discuss our concerns.

Sincerely,

Elizabeth A. Higgins

Elizabeth A. Higgins, Assistant Director
for Environmental Review
Office of Government Relations
& Environmental Review (RGR-2203)

cc: Vern Lang, USFWS
Sam Mygatt, MEPA

The Commonwealth of Massachusetts

Office of the Secretary of State
Michael Joseph Connolly, Secretary

Massachusetts Historical Commission
Valerie A. Talmage
Executive Director
State Historic Preservation Officer

July 18, 1986

Joseph Ignazio
Chief, Planning Division
Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02554

RE: JFK Library Pier, Dorchester, MA

Dear Mr. Ignazio:

Thank you for submitting a copy of the engineering plan for the proposed commercial pier and additional information on the proposed navigational turning dolphins at JFK Library in Dorchester. The proposed project is adjacent to the Calf Island Pump Station, a property which is considered eligible for listing in the National Register of Historic Places.

As you have indicated, the navigational dolphin design has yet to be selected between concrete or wood pilings. MHC concurs that the proposed pier and dolphins will have "no adverse effect" on the historic character and setting of the Calf Island pump station, provided that wood and timber are used in their construction. However, the alternate use of concrete dolphins would introduce visual elements which are uncharacteristic of, and may adversely affect the waterfront setting of the pump station.

These comments have been supplied in compliance with Section 106 of the National Historic Preservation Act (36 CFR 800). If you have any questions, please contact Brona Simon at this office.

Sincerely,

Valerie Talmage

Valerie A. Talmage
Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

xc: Marianne Metheny, ACE

VAT/BS/dr 80 Boylston Street, Boston, Massachusetts 02116 (617) 727-8470

COASTAL ZONE
MANAGEMENT

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

16 July, 1986

Edward D. Hammond, LTC
Acting Division Engineer
Planning Division, Impact Analysis Branch
NED, U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

RE: JFK Library Pier Project Proposal

Dear Sir:

This letter is in response to your request for comments regarding the above referenced project. While we welcome the opportunity to comment in the initial stages of project planning and again commend your office for the foresight to request such timely input, the following observations are preliminary. A formal federal consistency review will be conducted upon receipt of your consistency determination.

1. No site plan was included in the information provided. A site plan will be required in the formal consistency review which details both the two proposed pier location alternatives, with the preferred alternative identified, and the sampling sites.

2. There is some question as to the accuracy of the results of the chemical analysis of the sediments. The lead concentration of 2980 ppm at Site "B", would be, if accurate, the highest lead concentration ever recorded in Boston Harbor, an order of magnitude greater than concentrations observed in Boston Inner Harbor and Fort Point Channel. The PCB concentrations seem unusually high as well, though relatively high concentrations have been detected nearby in Dorchester Bay and the Neponset River. Additional sampling and analysis shall be required during our consistency review. These additional testing should be sufficient to judge the accuracy and precision of the existing data set.

3. Given the level of contamination of the sediments bioassay and bioaccumulation testing will be required for the formal consistency review unless the project proponent can provide supplemental information which indicates that additional testing is unnecessary.

4. Comments made by the authors in the section of the report dealing with "Biological Characteristics" (Section 3, Paragraph 3) are entirely correct. It is, therefore, difficult to understand how, given the acknowledged inadequacies, such specific and encompassing conclusions were arrived at by the authors. In specific:

a. Winter species assemblages are not particularly useful in characterizing indigenous benthic community composition, especially considering the life history characteristics of the dominant polychaetes and oligochaete.

b. If, as it was correctly pointed out by the authors, a 1 mm seive was found insufficient for quantitative analysis, why was it used?

c. Diversity indices are, with few exceptions, uniformly misleading and probably provide no useful information in terms of benthic community analysis. This is especially true of information theoretic based indices such as those used in the report. All references to H' and J' should be removed from the report to preclude misinterpretation by those who do not fully understand their limitations.

d. The number and size of the cores and replicates are probably inadequate for any sufficient description of the indigenous benthic community. Given that the total area sampled was 0.4 M^2 and the relatively "patchy" distribution of the organism, it is not difficult to understand why few Mya were encountered. A more comprehensive and appropriate sampling design may have produced a significantly different and ultimately more useful result.

e. Despite the possible contamination problems with the "pump house" site, this alternative would be preferable given the the greater fetch from the southwest at the "library" site. Because the exposure, and therefore the movement of water and sediment, at the "library" site could be characterized as a more physically dynamic, the potential exists for a greater alteration of the existing sediment and flow regimes resulting from the construction of the pier. There are additional considerations dealing with how the exposure would affect the actual use of the pier and anchorage/moorage concerns.

The sampling design and analysis is, in my opinion, inadeqate for the purpose of characterizing indigenous benthic community structure. It is strongly advised that this report be critically re-evaluated as to its sufficiency and, if found necessary, additional samples collected and analysed to lend support to the existing data.

Thank you for providing the opportunity to comment at this time. Should you have any questions, please feel free to contact me at 727-9530.

Sincerely,

Bradley W. Barr

Bradley W. Barr
Coastal Biologist

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

July 8, 1986

Planning Division
Coastal Development Branch

Rear Admiral Robert B. Johanson
First Coast Guard District
150 Causeway Street
Boston, Massachusetts 02114

Dear Admiral Johanson:

The Corps of Engineers is providing environmental and engineering services to the National Archives and Records Administration for a proposed channel and pier construction at the John F. Kennedy Presidential Library in Boston Harbor. The enclosed documentation describes the proposed project. The purpose of this letter is to initiate coordination and solicit your agency's comments.

We request your review of the enclosures. Any navigational concerns or information you could provide to us regarding the project area would be greatly appreciated.

Sincerely,

Thomas A. Rhen
Colonel, Corps of Engineers
Division Engineer

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Management Division
Habitat Conservation Branch
2 State Fish Pier
Gloucester, MA 01930-3097

June 18, 1986 F/NER74:DB

Mr. Joseph L. Ignazio
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254-9149

Dear Mr. Ignazio;

This is in response to your letter to Douglas Beach dated May 21, 1986, requesting a list of endangered or threatened species present in the area of a dredging and pier construction project at the John F. Kennedy Library on Columbia Point, Boston, Massachusetts pursuant to Section 7(c) of the Endangered Species Act of 1973 (ESA).

We have identified the presence of no endangered or threatened species in the project area that come under the jurisdiction of the National Marine Fisheries Service. However, the Foul Area Disposal Site is inhabited by endangered humpback (Megaptera novaeangliae) and fin (Balaenoptera physalus) whales from May until October, and the endangered right whale (Balaena glacialis) inhabits the area from March through May. The type and quantity of material that will be disposed, the contaminant levels in the material, and more detail on the method and timing of the disposal must be clearly described in order to assess the potential effects of the project on the endangered species mentioned above.

For your information, we are attempting to reduce the need for duplicate responses on projects with marine resource and endangered species concerns. Henceforth, our field station representatives will address endangered species concerns in their initial response to any project. This should streamline the review process by including the preliminary Section 7 screening for the presence of endangered species in the initial review by our field staff. Therefore, for those projects where the Corps needs a written response under the ESA, please ask our field representative to incorporate endangered species concerns in their review. Should endangered species become a concern for any project, I will be notified by the field representative, and will become involved in the project review process if necessary. If you have any questions on this, please contact me at FTS 837-9254.

Sincerely,

Douglas W. Beach
Wildlife Biologist

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

June 18, 1986

Planning Division
Impact Analysis Branch

Ms. Brona Simon
State Archaeologist
Massachusetts Historical Commission
80 Boylston Street
Boston, Massachusetts 02116

Dear Ms. Simon:

Enclosed are engineering diagrams for the proposed JFK Library Pier Project which you requested in your conversation with Marianne Matheny on June 16, 1986. This is the most recent information we have on the design plans. The proposed pier and turning dolphins will be constructed of concrete or wood pilings, depending on final engineering design.

Please review the enclosed material and send us any comments or concerns you have about potential project designs. If our office can be of further assistance, please contact Marianne Matheny at 617-647-8140.

Sincerely,

Joseph L. Ignazio
Chief, Planning Division

Enclosure

The Commonwealth of Massachusetts

Office of the Secretary of State
Michael Joseph Connolly, Secretary

Massachusetts Historical Commission
Valerie A. Talmage
Executive Director
State Historic Preservation Officer

June 16, 1986

Joseph Ignazio
Chief, Planning Division
Army Corps of Engineers
Waltham, MA 02254

RE: Kennedy Library Dock, Boston Harbor

Dear Mr. Ignazio:

Staff of the Massachusetts Historical Commission have reviewed the project information you provided concerning the proposed construction of a commercial pier at the Kennedy Library in Boston.

The Calf Island Pump Station, a property which appears to meet the criteria of eligibility for listing in the National Register of Historic Places, is located near the project planning area. MHC requests that project design plans of the proposed dock and navigational dolphins be submitted to the MHC in order to evaluate the effects of the proposal on this nearby historic property.

These comments have been supplied in compliance with Section 106 of the National Historic Preservation Act of 1966 (36 CFR 800). If you have any questions, please contact Brona Simon at this office.

Sincerely,

Valerie Talmage

Valerie A. Talmage
Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

VAT/ls

80 Boylston Street, Boston, Massachusetts 02116 (617) 727-8470

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

June 25, 1986

Planning Division
Impact Analysis Branch

Mr. Gordon E. Beckett, Supervisor
Fish and Wildlife Service
Ecological Services
P.O. Box 1518
Concord, New Hampshire 03301-1518

Dear Mr. Beckett:

The Corps of Engineers is providing environmental and engineering consulting services to the National Archives and Records Administration for a proposed channel and pier construction at the John F. Kennedy Presidential Library in Boston Harbor. The attached documentation describes the proposed project. The purpose of this letter is to initiate coordination and solicit your office's comments.

We request your review of the enclosures. Any environmental information your office could provide to us regarding the project area would also be greatly appreciated.

Sincerely,

Joseph L. Ignazio
Chief, Planning Division

Same letter also sent to the following:

National Park Service - Regional Office
Planning and Resource Preservation
ATTN: David E. Clark, Environmental Compliance Officer
15 State Street
Boston, Massachusetts 02109

Mr. Kevin Kilduff
Executive Secretary
Conservation Commission
Room 805
One City Hall Square
Boston, Massachusetts 02201

Mr. Thomas E. Bigford
Habitat Conservation Branch
National Marine Fisheries Service
Two State Fish Pier
Gloucester, Massachusetts 01930-3097

Ms. Elizabeth A. Higgins
U.S. Environmental Protection Agency - Region 1
Office of Government Relations and
Environmental Review (RGR-2203)
JFK Federal Building
Boston, Massachusetts 02203

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO ATTENTION OF

June 25, 1986

Planning Division
Impact Analysis Branch

Mr. James Hoyte
Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

Dear Secretary Hoyte:

The Corps of Engineers is providing environmental and engineering consulting services to the National Archives and Records Administration for a proposed channel and pier construction at the John F. Kennedy Presidential Library in Boston Harbor. The attached documentation describes the proposed project. The purpose of this letter is to initiate coordination and solicit your office's comments.

We request your review of the enclosures. Any environmental information your office could provide to us regarding the project area would also be greatly appreciated. In addition, we would like, if possible, a point of contact for further coordination on the project.

Sincerely,

Edward D. Hammond

EDWARD D. HAMMOND
LTC, Corps of Engineers
Acting Division Engineer

National Archives

Washington, DC 20408

MAY 22 1996

Col. Thomas A. Rhen
Planning Division
Coastal Development Branch
Corps of Engineers
Department of Army
424 Trapelo Road
Waltham, MA 02254-9149

Dear Colonel Rhen:

The National Archives is ready to proceed to the next stage of the Kennedy Library pier project. Based on your report on the Phase I study and on our meeting of May 15 with Mr. Mark Habel and other interested parties, we have decided on the location and the design of the pier.

The location we have chosen is, generally, that which you have called the "Library (North)" site in your study. The precise location of the Library site was modified somewhat in the May 15 meeting, but Mr. Habel, I believe, is familiar with the modification. It was moved a short distance to the south.

The design we have chosen was also discussed with Mr. Habel. It will be L-shaped, the long side extending 100 ft. at a right angle from the shore, the short side 50 ft. in length, with a 10 ft. x 20 ft. float, a catwalk, and associated dolphin pile clusters. The basic pier configuration and area to be dredged are depicted in the enclosed drawings.

We ask that you proceed on the basis of these decisions with the next phase of the project, which we understand will include preparation of the environmental assessment, biological testing, final pier and channel design, cost estimates, and regulatory coordination.

If you need information or have further advice, please contact either me (202:523-3076) or Mr. David Van Tassel (202:523-3073) of the Office of Presidential Libraries.

Sincerely,

JAMES C. MEGRONIGLE
Acting Assistant Archivist
for Management and Administration

Enclosures

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149
May 21, 1986

REPLY TO ATTENTION OF

Planning Division
Impact Analysis Branch

Mr. Douglas Beach
National Marine Fisheries Service
Habitat Protection Branch
14 Elm Street
Gloucester, Massachusetts 01930

Dear Mr. Beach:

We are proposing to conduct coordination of a dredging and pier construction project on behalf of the National Archives and Records Administration. The proposed project is located at Columbia Point in Dorchester Bay. The purpose of this letter is to request a list of endangered or threatened species for the project area, pursuant to Section 7(c) of the Endangered Species Act of 1973, as amended. Please find enclosed a location map of the area to aid you in your work.

The proposed project involves the dredging of a channel and construction of a commercial pier in proximity to the John F. Kennedy Library, Boston, Massachusetts (see Figure 1). The channel would provide deep draft vessel access to the pier form the Dorchester Bay Federal channel, for a commercial ferry service to the area. The purpose of this construction is to accommodate a water bus service to the library for tourism and provide dockage for the University of Massachusetts research vessels. The dredged material will be transported to the Foul Area Disposal Site by barge and disposed.

If you require any further information about the proposed project or the effected area please contact Mr. William A. Hubbard of the Impact Analysis Branch at FTS 839-7236.

Sincerely,

Nicholas E. Votg...
for Joseph L. Ignazio
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO ATTENTION OF

May 21, 1986

Planning Division
Impact Analysis Branch

Ms. Valerie A. Talmadge
Executive Director
Massachusetts Historical Commission
80 Boylston Street
Boston, Massachusetts 02116

Dear Ms. Talmadge:

A map is enclosed illustrating a proposed project area at the Kennedy Library Dock in Boston Harbor, Massachusetts. The proposed project involves the dredging of a channel and construction of a commericial pier in proximity to the John F. Kennedy Library, Boston, Massachusetts (see Figure 1). The purpose of this construction is to accommodate a water bus service to the library for tourism and provide dockage for the University of Massachusetts research vessels. The dredged material will be transported to the Foul Area Disposal Site by barge and disposed.

The proposed project would involve a 2100 foot (630 meter) long, 120 foot (36 meter) wide channel approximately ten feet (three meters) deep with a one foot (0.3 meter) overdredge. A 4.7 acre turning basin of the same depth would also be required. The pier design involves approximately 30 pilings and five (5) 12-pile dolphins, with pile depths 25-50 feet (7.5 to 15 meters) deep.

We anticipate no effect on archaeological or historical resources. We would appreciate any comments your office has on the above project, for inclusion in the project Environmental Assessment.

If you have any questions regarding this project, please contact Ms. Marianne Matheny at 647-8140.

Sincerely,

Nicholas E. Avtges
for Joseph L. Ignazio
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

February 28, 1986

Planning Division
Coastal Development Branch

Ms. Claudine J. Weiher
Assistant Archivist for
Management & Administration
National Archives & Records Admin.
8th Street & Pennsylvania Avenue, N.W.
Washington, D.C. 20408

Dear Ms. Weiher:

I am writing to provide you an update of the New England Division's study efforts concerning our work for you on the John F. Kennedy Library Pier project - Phase 1 Study. Our efforts to date have focussed on base data collection, preliminary engineering and cost estimates. We have investigated both the Pump House (south) Site and the Library (north) Site as you requested.

The chemical and physical testing phases of the sediment testing program were completed early this month. The results of this environmental sampling program reveal distinct differences between the two sites. The physical test results including grain size distribution curves and the chemical test results including bulk sediment, elutriate and water quality tests are provided on attachment 1.

In general the following comparisons may be made: the sediment at the Library Site appears to be more sandy than that from the Pump House Site; heavy metal concentrations at the Pump House Site are greater than at the Library Site; Polychlorinated Biphenols (PCB's), while found in elevated levels at both sites are significantly less at the Library Site. Once a final site selection is made, biological sampling and testing including the bioassay/bioaccumulation study can begin. In the recent past such projects in Massachusetts as; the Island End River, Chelsea (1981); Rockport Harbor and Pigeon Cove (1983); Chelsea River (1983) and Weymouth Fore River (1981) have been approved for ocean disposal at the Foul Area in Massachusetts Bay after exhibiting higher levels of PCB and heavy metal contamination than that found at the Library Site. Sediment exhibiting such levels as those found at the Pump House Site have never been approved for ocean disposal in New England waters.

The presence of significant contaminent levels at the Pump House Site would significantly increase the cost of construction at that site for special handling and disposal of the dredged material. Such costs have not yet been quantified. However, total project costs for the pier and channel, without considering possible special environmental costs for the Pump House Site, would be about $2,160,000 or $2,360,000 for the Library and Pump House Sites, respectively. Pier costs would probably be identical for either site. The pier cost estimate previously provided ($1,400,000) remains the best available. Preparation of detailed design and cost estimates for the pier is currently progressing.

Based on hydrographic and topographic surveys (copies enclosed), dredging quantities would be some what less for the Library Site, 69,000 vs 89,500 cubic yards. Because mobilization and administrative costs would be the same for either site, the actual difference in dredging cost would be about $200,000. Dredging at the Pump House Site would cost about $960,000 while dredging at the Library site would cost about $760,000. Details of the dredging costs for each site, based on open-water disposal at the Foul Area in Massachusetts Bay are provided on attachment 2.

As discussed at the last coordination meeting in Boston, the scope of pier improvements and design criteria being investigated are provided on attachment 3.

I would like to suggest that another coordination meeting be arranged in order to discuss final pier site selection. Once a final site is selected, preparation of the environmental assessment, biological testing, final pier and channel design and cost estimates and regulatory coordination can begin.

Should your staff have any questions concerning the data provided, please contact the project manager for this study, Mr. Mark Habel at (617) 647-8525.

Sincerely,

Thomas A. Rhen

Thomas A. Rhen
Colonel, Corps of Engineers
Division Engineer

Enclosure

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

September 26, 1985

Planning Division
Coastal Development Branch

Claudine J. Weiher
Assistant Archivist for
Management & Administration
National Archives
Washington, D.C. 20408

Dear Ms. Weiher:

Enclosed is a draft memorandum of understanding between the Corps of Engineers and the National Archives and Records Administration for services associated with the John F. Kennedy Library Navigation Project for your review and comment.

We will await hearing from you concerning this agreement and for a formal request to accomplish this work.

If you have any questions, please feel free to contact me at (617) 647-8220. Mr. Mark Habel will be the Project Manager for our effort and can be reached at (617) 647-8525.

Edward D. Hammond

Edward D. Hammond
LTC, Corps of Engineers
Deputy Division Engineer

Enclosure

National Archives

Washington, DC 20408

JUL 23 1985

Col. B. Scible, Division Engineer
Department of the Army
Corps of Engineers, NE Division
424 Trapelo Road
Waltham, MA 02254

Dear Col. Scible:

We have recently discussed the proposed Columbia Point small navigation project to design and construct a dock near the John F. Kennedy Library with Dan Fenn, Director of the Library, and Lew Pearson, Assistant Administrator for Public Buildings and Real Property, General Services Administration in Boston.

Before we initiate a formal request to the Corps of Engineers to undertake a detailed project study, we need some further information. We have received from Dan Fenn a copy of the September 1980 reconnaissance report prepared by the Corps, but it would be helpful if you would outline for us what the proposed project study would entail, when it will be completed, and whether there will be any cost to the National Archives for the study.

Once the study is completed, how does the Corps propose that we proceed with the actual design and construction and necessary dredging? Can this be done under some sort of interagency agreement between the National Archives and the Corps involving the transfer of the necessary funds to cover the cost of the project?

Once we receive your response, we may want to meet with you in Boston to review the project scope, timetable, and cost so that we may proceed in the most expeditious manner possible.

Sincerely,

Claudine J. Weiher

CLAUDINE J. WEIHER
Assistant Archivist for
Management and Administration
(202) 523-3076

National Archives and Records Administration